United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-92/170
March 1992

EPA

Superfund
Record of Decision:

General Motors/Central
Foundry Division , NY

NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R02-92/170	2.	3. Recipient's Accession No.

4. Title and Subtitle SUPERFUND RECORD OF DECISION General Motors/Central Foundry Division, NY Second Remedial Action - Final	5. Report Date 03/31/92
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. Type of Report & Period Covered 800/000
	14.

15. Supplementary Notes

PB93-963803

16. Abstract (Limit: 200 words)

The 270-acre General Motors/Central Foundry Division site is an aluminum casting plant in Massena, St. Lawrence County, New York. The site is bordered on the north by the St. Lawrence River; on the east by the St. Regis River Mohawk Indian Reservation, which includes Turtle Creek and wetlands; on the south by the Raquette River; and on the west by a manufacturing plant. Land use in the area is mixed industrial and residential, with the nearest residence located 300 feet from the site. The site contains at least seven areas that were used previously as waste disposal areas. From 1959 to 1980, hydraulic fluids containing PCBs were used in the manufacturing process at the plant. During the 1960's and 1970's, PCB oil-laden wastewater was discharged onsite into four industrial lagoons, resulting in PCB-laden sludge. The sludge from these lagoons was removed periodically and placed in the unlined North and East Disposal Areas and in the Industrial Landfill. Solid industrial wastes were also placed in the Industrial Landfill. In 1975, a berm surrounding the East Disposal Area was breached and water and sludge flowed to the St. Regis Mohawk Indian Reservation and Turtle Creek. Visible spill material was removed from the Reservation and relocated to the site property. From 1985 to 1989, General Motors investigations detected contamination in soil,

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - General Motors/Central Foundry Division, NY
Second Remedial Action - Final
Contaminated Media: soil, sludge, debris, gw
Key Contaminants: VOCs (TCE), other organics (PAHs, PCBs, phenols)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 86
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

sludge, debris, sediment, ground water and surface water. In 1988, an interim cap was placed over the industrial landfill. A 1990 ROD addressed most affected areas of the site, including the St. Lawrence River System sediments, contaminated ground water, soils on the facility and the St. Regis Mohawk Indian Reservation, and material at four lagoons and the North Disposal Area. This ROD provides the final remedy for the contaminated soil, sludge, debris, and groundwater at the East Disposal Area and the Industrial Lagoon. The primary contaminants of concern are VOCs, including TCE; and other organics, including PCBs, phenols, and PAHs.

The selected remedial action for this site includes excavating 174,000 cubic yards of soil, sludge, debris, and all visibly oily soil containing greater than or equal to 500 mg/kg PCBs from the East Disposal Area, followed by onsite treatment by either biological, thermal, or other treatment as determined by the results of treatability studies performed as part of remedy for OU1, disposing of debris offsite; consolidation and containment of soil with PCBs below 500 mg/kg in the East Disposal Area along with the treated soil and sludge; followed by covering with a composite cover; recontouring, regrading, and containing contaminated material from the Industrial Lagoon onsite with a composite cover; installing a slurry wall and runoff collection system to control ground water migration from the East Disposal Area and the Industrial Lagoon, treating ground water using air stripping to remove VOCs and carbon adsorption to remove PCBs with onsite discharge to the St. Lawrence River; monitoring ground water, surface water, and air; and implementing institutional controls, including deed restrictions, to discourage use as a residential area. The estimated present worth cost for this remedial action ranges from $31,000,000 to $45,000,000, which includes an annual O&M cost of $567,000 for years 0-2 and $200,000 for years 3-28.

PERFORMANCE STANDARDS OR GOALS: The chemical-specific clean-up goal for treated soil residuals is 10 mg/kg for PCBs, which is an onsite residual disposal ARAR waiver of the TSCA regulation concerning landfill requirements of 2 mg/kg for PCBs; for sludge with initial PCB >500 mg/kg, clean-up residual level is 2 mg/kg (TSCA). Ground water clean-up goals are based on SDWA and state standards, and include PCB 0.1 ug/l, TCE 5 ug/l, and total phenols 1 ug/l.

ROD FACT SHEET

SITE

Name:	General Motors - Central Foundry Division (second operable unit)
Location:	Massena, St. Lawrence County, New York
HRS Score:	Group 5
NPL Rank:	350
EPA Contact:	Lisa Carson, (212) 264-6857

ROD

Date Signed:	3/31/92
Remedy:	Excavation and treatment of sludge, visibly oily soil, and highly contaminated soil in the East Disposal Area; in-place containment of less contaminated soils and control of groundwater in the East Disposal Area through the use of a composite cap and a slurry wall, and; recontouring and regrading followed by containment of contaminated material and groundwater control in the Industrial Landfill through the use of a composite cap and slurry wall.
Capital Cost:	\$ 28,000,000 - \$ 42,000,000 (Costs will depend on the type of treatment technology used at the Site. Costs range from \$ 28 million for solidification to \$ 42 million for incineration.)
O & M/Year:	\$ 567,000 (years 1 and 2); \$200,000 (year 3 - 30)
Present Worth:	\$ 31,000,000 - 45,000,000

LEAD

Potentially Responsible Party

Main PRP:	General Motors Corporation

WASTE

Type:	PCBs
Media:	Sediments, soil, sludges, and groundwater
Origin:	On-site disposal of PCBs used in hydraulic fluids
Est. Quantity:	Approximately 598,000 cubic yards of PCB contaminated material addressed in this ROD

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

General Motors Corporation - Central Foundry Division Site
Massena, St. Lawrence County, New York

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the second operable unit for the General Motors - Central Foundry Division Superfund Site, in Massena, New York, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document summarizes the factual and legal basis for selecting the second operable unit remedy for this Site.

The New York State Department of Environmental Conservation has not concurred on the selected remedy. The information supporting this remedial action decision is contained in the Administrative Record for this Site, the index of which is appended to this document.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances at or from this Site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This action or "operable unit" is the second of two operable units that were planned for the Site. The first operable unit Record of Decision, dated December 17, 1990, addressed the threats resulting from the majority of the areas of the Site including: contaminated sediments and soils in the St. Lawrence and Raquette Rivers, Turtle Creek, and associated riverbanks and wetlands (the St. Lawrence River System); runoff from the East Disposal Area; contaminated sludges, soil, and debris in the North Disposal Area, in and around the four Industrial Lagoons, and in other areas on General Motors' (G.M.) property; contaminated soil on the St. Regis Mohawk Reservation; and contaminated groundwater associated with the Site.

This second operable unit Record of Decision addresses the remaining areas of the Site by utilizing a mixed treatment/containment remedy in the East Disposal Area and containment of the Industrial Landfill at the Site. The combination of this second operable unit Record of Decision and the December 17, 1990 first operable unit Record of Decision comprise a comprehensive remedy for the Site.

The major components of the second operable unit selected remedy include:

- Excavation of soil containing polychlorinated biphenyls (PCBs) at concentrations at or above 500 parts per million, all sludge, and all visibly oily soil from the East Disposal Area at the Site;

- Consolidation and in-place containment of less contaminated soils (containing PCBs at concentrations above 10 ppm and below 500 ppm) in the East Disposal Area and control of groundwater migration from the East Disposal Area through the use of a composite cap and a slurry wall. (The slurry wall is contingent on the results of additional groundwater testing to be conducted during design. See page 41 of the ROD Decision Summary.);

- Recontouring, regrading, and containment of contaminated material in the Industrial Landfill and control of groundwater migration from the Industrial Landfill through the use of a composite cap and slurry wall (The slurry wall is contingent on the results of additional groundwater testing to be conducted during design.);

- Treatment of excavated material from the East Disposal Area by either biological treatment (or another innovative treatment technology which has been demonstrated to achieve Site treatment goals) or thermal destruction to be determined by the U. S. Environmental Protection Agency (EPA) following first operable unit treatability testing. Treatability testing was previously selected as part of the first operable unit Record of Decision and EPA will base its decision on the results of that testing. Treatment residuals will be disposed on-site. (During first operable unit treatability testing, other innovative PCB treatment technologies will be tested concurrently with biological treatment so that EPA will have additional information in the event that biological treatment proves to be unsatisfactory for treatment of any Site material.) EPA will select the treatment technologies to be employed, in consultation with NYSDEC and the St. Regis Mohawk Tribe.

DECLARATION

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action (or provides grounds for invoking a waiver of these requirements), and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies which employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels in the Industrial Landfill and East Disposal Area, a review will be conducted within at least five years after commencement of remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

Constantine Sidamon-Eristoff
Regional Administrator, Region II
U. S. Environmental Protection Agency

3/31/92
Date

DECISION SUMMARY

GENERAL MOTORS - CENTRAL FOUNDRY DIVISION SITE

MASSENA, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

NEW YORK

TABLE OF CONTENTS

SITE NAME, LOCATION, AND DESCRIPTION

The General Motors - Central Foundry Division (G.M.) Site is located on Rooseveltown Road in St. Lawrence County in Massena, New York. The Site consists of several waste areas at an active G.M. manufacturing facility along with contaminated soils on G.M.'s property and on the St. Regis Mohawk Reservation, contaminated sediments in the St. Lawrence and Raquette Rivers and in Turtle Creek, associated riverbanks and wetlands, and contaminated groundwater.

The G.M. facility is bordered on the north by the St. Lawrence River, on the east by the St. Regis Mohawk Indian Reservation, on the south by the Raquette River and on the west by the Reynolds Metals Company and property owned by Conrail (see Figure 1). Land use in the area surrounding the Site consists of mixed residential and industrial uses. The Reynolds Metals Company facility and another facility west of the Site owned by the Aluminum Company of America are presently under investigation by the U. S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The nearest residence is located on the St. Regis Mohawk Indian Reservation approximately 300 feet from the G.M. facility boundary. St. Lawrence River flows are controlled by the Moses-Saunders Power Dam, located approximately four miles upstream from the Site.

The G.M. facility consists of approximately 270 acres of industrial and undeveloped land. Wetlands lie east of the facility in the area surrounding Turtle Creek. There are no federally listed endangered or threatened species known to inhabit the St. Lawrence River. However, the River does support a number of New York State listed endangered, threatened and special concern fish species. The River and adjacent habitats also provide nesting for a variety of water birds and shorebirds. Federally listed endangered falcons and bald eagles have been reported in the Massena area.

The Site, as defined by EPA, consists of several major areas which are depicted schematically in Figure 2. The North and East Disposal Areas and the Industrial Landfill contain soil, debris, and sludge. The four unlined Industrial Lagoons contain liquids, sludges, and solids and are referred to as the 350,000 gallon, 500,000 gallon, 1.5 million gallon and 10 million gallon lagoons. The Site also includes contaminated sediments, riverbanks, and associated wetlands of the St. Lawrence River, the Raquette River and Turtle Creek (formerly called the unnamed tributary on the St. Regis Mohawk Reservation) (these water bodies and associated areas are collectively referred to as the St. Lawrence River System), contaminated soil on the St. Regis Mohawk Indian Reservation, contaminated soil on G.M. property not associated with the specific disposal areas already mentioned, and contaminated groundwater.

Groundwater flow generally reflects surface topography and flows north toward the St. Lawrence River and northeast to Turtle Creek. Turtle Creek and the adjacent wetlands serve as discharge areas for shallow groundwater flow. There is also some limited shallow groundwater flow south toward the Raquette River. A few residents on Raquette Point rely on groundwater as a drinking water supply. The majority of the Raquette Point residents obtain water from a public water supply system which has its intake in the St. Lawrence River at the mouth of the Raquette River, approximately 1.5 miles downriver from the G.M. facility.

In general, the East Disposal Area and Industrial Landfill are underlain by 20 to 30 feet of glaciolacustrine marine deposit and glacial till (see Figure 3). These materials are underlain by a lower glaciofluvial deposit which is approximately 10 to 15 feet thick and which is underlain by another 40 to 60 feet of glacial till. The average hydraulic conductivity of the lower glaciofluvial deposit is somewhat higher than that of the glacial till layers. Bedrock at the Site is generally located approximately 120 to 140 feet below the natural ground surface.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

G.M. has operated an aluminum casting plant at the Site since 1959. Until 1980, polychlorinated biphenyls (PCBs) were a component of hydraulic fluids used in diecasting machines at the G.M. facility. PCBs provided protection against fire and thermal degradation in the high temperature environment of the diecasting machines. G.M. no longer uses the diecasting process or PCBs at the facility.

In the early 1960's, as part of routine operations, wastewater containing PCB-laden oil passed through the 1.5 million gallon lagoon and then to the St. Lawrence River. In 1968-1969, a lined interceptor lagoon was added adjacent to the 1.5 million gallon lagoon. This lined lagoon was subsequently buried and is considered by EPA to be a part of the North Disposal Area. In 1976, a wastewater treatment system was installed at the plant. In that system, wastewater was sent to the 350,000 gallon lagoon for solids settling. Treated water was pumped to the 500,000 gallon and 10 million gallon lagoons for reuse as plant process water. Periodically, water was discharged to the St. Lawrence River from the 1.5 million gallon lagoon. The 1.5 million gallon lagoon was not used for settling after 1976; however, water passed through the 1.5 million gallon lagoon, which contained PCB sludges, prior to discharge to the St. Lawrence River after 1976. After further modifications to G.M.'s wastewater treatment process, the 350,000 gallon lagoon was taken out of service in 1980. All four lagoons are subject to the PCB disposal requirements under the Toxic Substances Control Act (TSCA) because they received and contain PCBs above regulated concentrations and were in use as part of G.M.'s wastewater treatment process after February 17, 1978, the cut off date for cleanup and disposal of contamination that occurred prior to the PCB regulations.

During operations, PCB laden sludge from the 1.5 million gallon lagoon and from the wastewater treatment plant was periodically removed to the North and East Disposal Areas and to the Industrial Landfill. The Industrial Landfill has also received foundry sand, soil and concrete excavated during plant construction, diecasting machines, and solid industrial waste. The Landfill was covered with an interim cap in 1987-1988. The North Disposal Area also received construction debris, soil and tree stumps. The East Disposal Area contains soil and sludge along with construction debris and concrete. The North and East Disposal Areas and the Industrial Landfill were not lined.

In 1975, a berm surrounding the East Disposal Area was breached. Water and sludge flowed east to the St. Regis Mohawk Reservation and to Turtle Creek. Visible spill material was removed from the Reservation to G.M. property. In 1970, PCB contaminated soil excavated during plant expansion was placed on the north bank of the Raquette River. In addition, G.M. discharged surface water runoff to the Raquette River until 1989 under a State Pollutant Discharge Elimination System (SPDES) permit.

The G.M. Site was placed on the Superfund National Priorities List (NPL) in September 1983 as a result of G.M.'s past waste disposal practices. G.M. indicated a willingness to perform the Remedial Investigation and Feasibility Study (RI/FS) for the Site. On April 16, 1985, EPA and G.M. entered into an Administrative Order on Consent (Index No. II CERCLA-50201) for G.M.'s performance of the RI/FS. Draft and Phase II RI reports were submitted to EPA in May 1986 and May 1988, respectively.

G.M. performed additional river sampling in February 1989 and submitted a report on the additional sampling to EPA in May 1989. On June 9, 1989, EPA approved the RI report, which consists of the draft RI report, the Phase II RI report and the sediment sampling report, for the Site. The RI report delineated those areas in need of remediation throughout the Site. G.M. submitted the draft FS report to EPA in November 1989.

The FS and first phase (or "first operable unit") Proposed Plan for the G.M. Site were released to the public in March 1990. A public comment period was held from March 21, 1990 through June 18, 1990 to accept comments on the first operable unit Proposed Plan. On December 17, 1990, EPA signed the first operable unit Record of Decision (ROD). The contents of the first operable unit ROD are discussed in the section "Scope and Role of Response Action" which begins on page 4 of this document.

G.M. also entered into a 1985 Consent Order with EPA under the authority of TSCA. In addition to payment of penalties for failure to comply with certain TSCA regulations, G.M. agreed to cleanup and close an abandoned PCB contaminated pump house on-site. On March 12, 1991, EPA issued a TSCA complaint to G.M charging improper off site disposal of PCB contaminated sludges. This complaint has not yet been settled.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The second operable unit Proposed Plan for the G.M. Site was released to the public on May 28, 1991. This document, along with the RI and FS, were made available to the public in information repositories maintained at EPA Region II offices in New York city, at the Massena Public Library, and at the St. Regis Mohawk Tribal Building. The notice of availability of these documents was published in the Massena Daily Courier-Observer on May 28, 1991 and in the People's Voice and the Indian Times on May 24, 1991. A public comment period was held from May 28, 1991 through July 29, 1991. The public comment period was extended once upon the request of several interested citizens. Notice of the extension was published in the newspapers listed above on June 21, 1991.

Public meetings were held on June 25, 1991 at the Massena Town Hall and on June 26, 1991 at the Mohawk School in Akwesasne. At these meetings, representatives from EPA answered questions and received comments on EPA's second operable unit Proposed Plan and the other remedial alternatives under consideration. Responses to comments received during the public comment period and at the public meetings are included in the Responsiveness Summary which is appended to this ROD. The Responsiveness Summary and ROD, along with the Administrative Record for the Site, are available at the information repositories referenced above.

SCOPE AND ROLE OF RESPONSE ACTION

In selecting a remedy for the G.M. Site, EPA divided the Site into two phases or "operable units." Using two operable units, EPA could better factor community concerns into its decision-making process for cleanup of the Industrial Landfill. In August 1990, EPA issued its "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," OSWER Directive 9355.4-01, August 1990. This guidance, commonly called "the PCB Guidance," recommends that when considering cleanup of areas which contain large volumes of PCB contaminated material, a cleanup alternative which combines treatment of highly contaminated material with containment of less contaminated material be evaluated.

The first operable unit ROD presents the selected remedy for most areas of the G.M. Site, including the contaminated St. Lawrence River System sediments, contaminated groundwater, soils on the G.M. facility and on the St. Regis Mohawk Reservation, and material in the four Industrial Lagoons and the North Disposal Area at the Site. The second operable unit, which is the subject of this ROD, addresses remediation of material in the East Disposal Area and the Industrial Landfill at the Site.

The first operable unit selected remedy includes: dredging and excavation of sediments and soils from PCB contaminated areas in the St. Lawrence and Raquette Rivers and associated riverbanks and wetlands with PCB concentrations above 1 part per million (ppm); dredging and excavation of sediments and soils with PCB concentrations above 0.1 ppm from Turtle Creek and the Raquette River on the Reservation, and associated riverbanks and wetlands; interim surface runoff control to prevent migration of contamination from the East Disposal Area; excavation of PCB contaminated sludge, soil, and debris with PCB concentrations above 10 ppm in the North Disposal Area, in and around the four Industrial Lagoons, and in other areas on General Motors property; excavation of PCB contaminated soil on the St. Regis Mohawk Reservation adjacent to the G.M. facility with PCB concentrations above 1 ppm; recovery and treatment of contaminated groundwater downgradient from the Site with discharge of treated groundwater to the St. Lawrence River; and treatment of dredged/excavated material by either biological treatment (or another innovative treatment technology) or thermal destruction. The treatment technology will be determined by EPA following treatability testing. Treatment residuals are to be disposed on the G.M. Site. Other innovative PCB treatment technologies will be tested concurrently with biological treatment so that EPA will have additional information in the event that biological treatment proves to be unsatisfactory for treatment of any Site material.

In developing the first operable unit ROD, EPA evaluated available data in the RI and FS reports for the G.M. Site. EPA also analyzed the Site to ensure consistency with its PCB Guidance. EPA determined that the first operable unit ROD remedy was consistent with the PCB Guidance.

EPA is willing to consider data gathered during design and/or implementation of the first operable unit remedy in order to ascertain whether such data confirm that the first operable unit remedy is consistent with the PCB Guidance. Consistent with the PCB Guidance, EPA believes that each of the following types of materials are not amenable to containment without prior treatment: sludge; oily waste; soil with PCB concentrations above 500 ppm; soil with phenol concentrations above 50 ppm; material which is saturated with water; soil which contains PCBs at concentrations below 500 ppm but which cannot be practicably segregated from sludge, oily waste, or soil with PCB concentrations above 500 ppm; and/or, soil with PCB concentrations between 10 and 500 ppm which is not described by any of the above-listed characteristics, but which is of insignificant volume such that treatment of such soil is cost-effective. Based on data available in the RI and FS, EPA believes that treatment of the above types of material will result in a significant (on the order of 90%) reduction of the PCB mass addressed in the first operable unit ROD.

In order to expedite Site cleanup, the second operable unit remedy for the East Disposal Area and the Industrial Landfill will be consistent with the remedy selected in the first operable unit ROD. The remediation of the entire G.M. Site will be complete only after EPA has implemented remedial actions for both operable units. The final remediation of the Site is intended to address the entire Site with regard to the principal threats to human health and the environment posed by the Site. The findings of the Risk Assessment are discussed in the section entitled "Summary of Site Risks" which begins on page 9 of this document.

SUMMARY OF SITE CHARACTERISTICS

Contaminant Characteristics

Based on sampling and analyses conducted during the RI/FS, there are four major contaminants at the G.M. Site - PCBs, polyaromatic hydrocarbons (PAHs), phenols and volatile organic compounds (VOCs). At the G.M. Site, PAHs, phenols, and VOCs were found at much lower concentrations and in fewer samples than PCBs and, consequently, pose lower risks than PCBs. Therefore, the primary contaminant of concern at the Site is PCBs. Any method of treatment or containment selected for the Site will also be effective for PAHs, phenols, and VOCs. For these reasons, PCBs have, in most cases, driven the remedy selection at this Site, although EPA intends to address all contaminants during the cleanup of the Site.

PCBs tend to bioaccumulate in human and animal fatty tissue and are classified by EPA as probable human carcinogens. The major target organs of PCB exposure are the liver and skin. Occupational exposure to relatively high concentrations of PCBs have resulted in changes in blood levels of liver enzymes and skin effects such as chloracne. PCBs have produced liver tumors in laboratory studies of rats. In addition, PCBs cause adverse reproductive effects in laboratory animals at low levels and may cause similar results in humans.

Affected Media

This section summarizes the quantities and types of contamination found in the East Disposal Area and the Industrial Landfill and associated groundwater, the areas of the Site under consideration in this ROD. Table 1 summarizes the types of contaminants and their concentrations in several areas of the Site.

East Disposal Area

It is estimated that the East Disposal Area consists of approximately 174,000 cubic yards of soil, debris and sludge with PCB concentrations greater than 10 ppm. The highest PCB concentration detected in the East Disposal Area is 41,000 ppm. Phenols were detected in East Disposal Area samples with a maximum phenol concentration of 11,000 ppm.

The estimated volumes of contaminated soil and sludge associated with various PCB contamination levels for the East Disposal Area are given below. The volumes in the second column represent the estimated total volume of material with concentrations above the corresponding contamination level. These volumes and additional volume estimates will be verified during the remedial design and remedial action phases of the project.

PCB Contamination Level	Total Volume of Soil, Sludge, and Debris
10,000 ppm	6,000 yd^3
2000 ppm	30,000 yd^3
1000 ppm	48,000 yd^3
500 ppm	59,000 yd^3
50 ppm	100,000 yd^3
25 ppm	150,000 yd^3
10 ppm	174,000 yd^3
TOTAL	174,000 yd^3

The pattern of PCB contamination in the East Disposal Area is generally consistent with the history of past disposal practices in that area. PCB contaminated sludges were originally pumped to a bermed disposal area east of the plant to provide a sludge settling basin. Most of the PCBs observed in the East Disposal Area are found within the original sludge disposal area. This basin was approximately 3 acres in size. When the berm was breached in the summer of 1975, water and sludge flowed east toward the Reservation. The data also identify a tongue of PCB contaminated soil to the east of the original disposal area which is the remains of the 1975 breach (see Figure 4). Two smaller, less contaminated areas of PCB contamination were also identified to the southwest of the original disposal area and south of the Industrial Landfill.

The East Disposal Area was filled, in part, with construction debris and soil in 1977. As a result, debris and concrete were noted in several East Disposal Area borings. Due to the presence of the debris and boulders, excavation in some locations in the East Disposal Area may be technically complex.

Groundwater beneath the East Disposal Area contains low levels of PCBs and phenols (see Table 1). The highest level of PCBs detected in East Disposal Area groundwater is 1.7 parts per billion (ppb). The highest level of phenols detected in East Disposal Area groundwater is 60 ppb. These levels were detected in wells screened in the lower glaciofluvial layer.

Industrial Landfill

The Industrial Landfill contains approximately 424,000 cubic yards of soil, debris and sludge with PCB concentrations greater than 10 ppm. Of this amount, there are approximately 50,000 - 100,000 cubic yards of soil with PCB concentrations above 500 ppm buried in the Industrial Landfill. The highest PCB concentration detected in the Industrial Landfill is 4,300 ppm. Phenols were detected in three Industrial Landfill samples with a maximum phenol concentration of 51 ppm. The Landfill rises approximately 35 feet above natural ground level.

Unlike the East Disposal Area, no localized areas of high level PCB contamination (known as "PCB hotspots") were found in the Industrial Landfill. Historically, the Industrial Landfill received foundry sand, soil, construction debris, and solid waste, in addition to PCB contaminated sludge, lubricants, caustic waste, degreasers, and aluminum dross. Based on historical information, it is believed that the volume of sludge disposed in the Landfill was much less than that disposed in the East Disposal Area.

The Industrial Landfill presently has an interim vegetated clay cover which was placed on the Landfill in 1988. The majority of the highly PCB contaminated material in the Landfill is covered by several feet (between 5 and 15 feet) of material with lower PCB concentrations.

The highest level of PCBs detected in groundwater beneath the Industrial Landfill is 1.3 ppm. VOCs were also detected in some Industrial Landfill groundwater samples with maximum vinyl chloride, dichloroethylene, and trichloroethylene concentrations of 50 ppb, 686 ppb and 50 ppb, respectively.

Potential Routes of Migration and Exposure

Contamination may migrate from uncovered areas, including the East Disposal Area, into groundwater, surface water, and off the G.M. facility. Contaminated soil may be ingested or may come into dermal contact with workers or trespassers. The volatilization of PCBs from the East Disposal Area is also a potential route of exposure. PCBs carried in surface water runoff may migrate to the Reservation. In addition, PCBs in soil may be ingested by wildlife and begin to bioaccumulate within the food chain, eventually accumulating within human fatty tissue.

SUMMARY OF SITE RISKS

EPA conducted a baseline risk assessment to evaluate the potential risks to human health and the environment associated with the G.M. Site in its current state. The qualitative and quantitative information on risks to human health presented in this section is based on EPA's "Baseline Risk Assessment for the G.M./Massena Site" which, in turn, was based on the "Superfund Public Health Evaluation Manual" (U.S. EPA, 1986). Qualitative information on environmental risks is based on a recent draft study of contaminants in wildlife performed by NYSDEC and the St. Regis Mohawk Tribe and preliminary natural resource surveys performed by NYSDEC, the St. Regis Mohawk Tribe, the U.S. Department of the Interior, and the National Oceanic and Atmospheric Administration.

Contaminant Identification and Exposure Assessment

Because PCBs are the primary contaminant of concern at the G.M. Site, EPA's baseline risk assessment for the Site reviewed the human health risks resulting from exposure to PCBs in East Disposal Area and Industrial Landfill soils and associated groundwater. The potential routes of human exposure to East Disposal Area and Industrial Landfill contamination are the ingestion of wildlife containing PCBs, infant ingestion of breast milk which contains PCBs due to bioaccumulation, ingestion of contaminated drinking water (potential future exposure route), ingestion of and dermal contact with PCB contaminated soil, and inhalation of dust carrying PCBs. Inhalation of dust was not quantitatively evaluated in the Baseline Risk Assessment and will not be discussed further here. Exposed populations include residents of the St. Regis Mohawk Indian Reservation, Canadians who are downriver of the Site, and G.M. workers.

A major assumption of the EPA risk assessment was that the G.M. Site would not be developed for residential uses in the future. In addition, because the St. Regis Mohawk Indian Reservation contains the closest residential population to the Site, the St. Regis Mohawk Tribe was considered the exposed population for the purposes of determining the exposure assumptions used in the risk assessment. Table 2 presents the exposure parameters used by EPA in its baseline risk assessment. Most probable and worst case exposures were evaluated.

Toxicity Assessment

Under current EPA guidelines, the likelihood of carcinogenic (cancer causing) and non-carcinogenic effects due to exposure to site chemicals are considered separately.

Potential carcinogenic risks were evaluated using the cancer slope factors developed by EPA for the contaminants of concern. Cancer slope factors (SFs) have been developed by EPA's Carcinogenic Risk Assessment Verification Endeavor for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to generate an upper-bound estimate of the excess lifetime cancer risk associated with exposure to the compound at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes the underestimation of the risk highly unlikely. The SF value for PCBs is 7.7 $(mg/kg\text{-}day)^{-1}$. This value, based on animal tests of several PCB mixtures, was calculated for the oral route of exposure but was used in EPA's risk assessment for all routes due to the absence of dermal and inhalation SFs for PCBs. EPA's current policy is to use one SF value for all commercial PCB mixtures.

Non-carcinogenic risks were assessed using a hazard index approach, based on a comparison of expected contaminant intakes and safe levels of intake (Reference Doses). Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects. RfDs, which are expressed in units of mg/kg-day, are estimates of daily exposure levels for humans which are thought to be safe over a lifetime (including sensitive individuals). The current RfD for PCBs is 0.0001 mg/kg-day. EPA is in the process of reviewing the RfD for PCBs.

Baseline Human Health Risk Characterization

Excess lifetime cancer risks for the Site were determined by multiplying the intake levels (given in Table 2) with the SF for PCBs, 7.7 $(mg/kg\text{-}day)^{-1}$. These risks are probabilities that are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that as a plausible upper bound, an individual has not greater than an additional one in one million chance of developing cancer as a result of Site-related exposure to PCBs over a 70-year period under the specific exposure conditions presented at the Site. EPA considers risks in the range 10^{-4} to 10^{-6} to be generally acceptable.

For known or suspected carcinogens, EPA considers excess upper bound individual lifetime cancer risks of between 10^{-4} to 10^{-6} to be acceptable. This level indicates that an individual has not greater than a one in ten thousand to one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year period under specific exposure conditions at the Site.

Table 3 presents a summary of the total carcinogenic risks and the carcinogenic risks posed by each exposure pathway under consideration in this ROD for residents of the St. Regis Mohawk Tribe. It can be seen from Table 3 that the most probable and worst case risks associated with ingestion of wildlife are 1.7×10^{-2} and 2.4×10^{-2}, respectively. These risks are considered unacceptable by EPA and are much greater than the risks associated with the other exposure pathways evaluated. The cumulative most probable upper bound cancer risk at the G.M. Site (excluding the risks from ingestion of fish) is 1.8×10^{-2}. Hence, the risks for carcinogens at the Site are considered unacceptable by EPA. The estimated total cancer risks are primarily due to ingestion of wildlife which has bioaccumulated PCBs.

Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) are compared with the RfD to derive the hazard quotient for the contaminant in the particular medium. The pathway hazard index (HI) is obtained by adding the hazard quotients for all compounds for a particular pathway that impact a particular receptor population. The cumulative HI is obtained by adding the pathway HIs for all compounds across all media that impact a particular receptor population. A HI greater than 1 indicates that the potential exists for non-carcinogenic health effects to occur as a result of site-related exposures. The HI provides a useful reference point for gauging the potential significance of multi-contaminant exposures within a single medium or across media.

Table 4 presents a summary of the pathway HIs and the cumulative HI for the G.M. Site. The cumulative HI at the G.M. Site (excluding fish ingestion) is 22.8 for the most probable case scenario and 36 for the worst case scenario. Hence, the HI at the Site exceeds the recommended maximum value of 1. The most probable and worst case HIs for wildlife ingestion are 21.7 and 31.1, respectively. As with carcinogenic effects, the non-carcinogenic effects associated with ingestion of wildlife are considered unacceptable by EPA and are much greater than the effects associated with the other pathways evaluated.

Environmental Risks

EPA, NYSDEC, the St. Regis Mohawk Tribe, and the natural resource trustees are continuing to assess the risks posed to the environment by the Site. NYSDEC and the St. Regis Mohawk Tribe, in a recent study of PCB concentrations in area wildlife, observed elevated PCB levels in several specimens, including frogs, snapping turtles, geese, and ducks.

Based on the currently available information, there are presently unquantified risks to the environment from the Site. PCBs have been detected in area wildlife and in wetlands which provide habitat for water birds and other wildlife.

New York State, the St. Regis Mohawk Tribe, the U.S. Department of Commerce, and the U.S Department of the Interior are each natural resource trustees pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) with trustee interests in the river system and environs as a result of the impacts noted in this ROD as well as other impacts to natural resources which have been observed. The trustees are currently in the preliminary stages of the natural resource damage assessment process.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis;
- environmental parameter measurement;
- fate and transport modeling;
- exposure parameter estimation; and,
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. One of the greatest sources of uncertainty in the G.M. Site Baseline Risk Assessment was the use of the oral

SF for PCBs due to the absence of dermal and inhalation SFs for PCBs. Uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the Baseline Risk Assessment provides upper bound estimates of the risks to populations near the Site, and is unlikely to underestimate actual risks related to the Site.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the Baseline Risk Assessment Report.

Risk Summary

Actual or threatened releases of hazardous substances at or from the Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF ALTERNATIVES

Remedial alternatives are presented in this section for the East Disposal Area and the Industrial Landfill at the Site. Because several of the alternatives include treatment or containment of PCBs, discussions of PCB treatment technologies and containment technologies are presented as an introduction. This is followed by a discussion of cleanup levels selected by EPA for these areas of the Site.

Treatment Technologies

Six methods of treatment for Site soil, sludges and sediments were examined: biological destruction, chemical destruction, chemical extraction, thermal destruction (incineration), thermal extraction and solidification. Each of these treatment technologies has been tested at other hazardous waste sites. Although some have been found to be effective in treating PCBs and other contaminants, each technology, with the exception of thermal destruction, would require a pilot or field testing program before full-scale use at this Site. Thermal destruction would require trial incinerator burns to establish operating conditions.

It should be noted, however, that testing of innovative treatment technologies was included as part of the first operable unit ROD for the G.M. Site. EPA intends that the results of the first operable unit treatability testing program will satisfy most, if not all, of the treatability testing data requirements for the entire G.M. Site such that additional treatability studies will not be required during design of the second operable unit remedy.

Biological Treatment

Biological destruction of PCBs using naturally occurring or scientifically engineered bacteria was determined to be a potentially feasible alternative for the remediation of contaminated soils, sediments, and sludges at the Site. At the G.M. Site, biological treatment would involve processing excavated soils and sludges or dredged sediment in slurry form in above-ground batch reactors. Preprocessing would be necessary to remove bulky items. Bacteria and nutrients would be added to the tanks and the tanks would be mechanically aerated and agitated. The bacteria would degrade PCBs to nonhazardous products. Preliminary bench-scale tests of Site soil by G.M. have demonstrated up to 82% reduction of PCBs, from 291 ppm to 52 ppm, after several months of anaerobic and aerobic biological treatment. Such a reduction, while promising, would not result in levels which are sufficiently low for cleanup or destruction. G.M. is continuing biological treatment tests in an effort to achieve greater reductions in PCB concentrations.

Because biological treatment would be performed on material in slurry form, a large quantity of water would be used during treatment and produced during subsequent dewatering operations. This water would be discharged to the St. Lawrence River in compliance with SPDES requirements which currently require that PCB concentrations in the discharge be non-detectable, down to the method detection level, using EPA Laboratory Method Number 608. Because PCB volatilization is a concern, if necessary, the reactors would be covered or fitted with emissions control equipment. Major applicable or relevant and appropriate requirements for biological treatment are federal Clean Air Act (CAA) and New York State air quality standards along with Resource Conservation and Recovery Act (RCRA) hazardous waste treatment regulations and TSCA disposal requirements.

Biological treatment is an innovative technology. Approximately six months to one year would be required for preliminary testing and technology development. In addition, biological treatment may not be effective in reducing PCB concentrations in those materials with initially high PCB concentrations to levels required for cleanup or disposal.

Chemical Destruction

This technology employs a chemical dechlorination process to treat contaminated soils, sludges, and sediments. For example, in the proprietary KPEG process, PCB contaminated materials are reacted with several reagents, including potassium hydroxide and polyethylene glycol or similar chemicals to remove the chlorine atoms from PCBs. If successful, this process converts PCBs to a glycol-substituted biphenyl compound which is less toxic than PCBs. Full-scale process equipment is currently available.

For this Site, chemical dechlorination would be performed in a batch mixed reactor at approximately 300°F with an excess of reagent. The vendor of this process believes that, based on work at other sites, residual PCB concentrations as low as 2 ppm are achievable. Site-specific testing of chemical dechlorination would be required in order to determine the effectiveness of the technology with respect to G.M. Site material.

Preprocessing is necessary to remove bulky items. Water, used to wash treated solids, would be discharged to the St. Lawrence River in compliance with SPDES requirements. Because PCB volatilization is a concern, if necessary, the reactors would be covered or fitted with emissions control equipment. Major applicable or relevant and appropriate requirements for chemical destruction are federal CAA and New York State air quality standards along with RCRA hazardous waste treatment regulations and TSCA disposal requirements.

<u>Chemical Extraction</u>

At the G.M. Site, the evaluation of chemical extraction was based on the proprietary B.E.S.T. (Basic Extractive Sludge Treatment) process. Other similar processes are also available. This technology involves concentrating PCBs found in large volumes of solids and sludges into smaller volumes of an oily extract through the use of triethylamine, a solvent. The PCB rich extract must then be disposed. Preprocessing is necessary to remove bulky items. Full-scale process equipment is currently available.

The vendor reports that, based on information from other sites, solids residual concentrations less than 0.1 ppm PCB are possible. Tests on sludge (not from the G.M. Site) showed PCB concentrations of 130 ppm in treated sludge with an initial PCB concentration of 5800 ppm. Site-specific testing of chemical extraction would be required in order to determine the effectiveness of the technology with respect to G.M. Site material.

Process water would be treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Major applicable or relevant and appropriate requirements for chemical extraction are TSCA disposal requirements, federal and State air quality standards, and RCRA hazardous waste treatment regulations. The PCB extract would be treated and disposed on-site or transported off-site for disposal, if necessary.

<u>Thermal Destruction</u>

Thermal destruction technology involves the incineration of solid material. After material processing, sorting and, if necessary, dewatering, solids and sludges are fed to the incinerator. A rotary kiln incinerator was used to develop cost estimates, however, the particular type of incinerator to be used would be determined during design. Incinerators are commercially available and have achieved the 99.9999% destruction removal efficiency required by TSCA.

Scrubber water would be treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Major applicable or relevant and appropriate requirements for thermal destruction are TSCA and RCRA incineration and disposal requirements, and federal and State air quality standards. Incinerator ash would be tested and, if found to be non-hazardous, backfilled on-site.

<u>Thermal Extraction</u>

Thermal extraction involves the volatilization of organics from a solid or sludge waste stream under lower temperature conditions than those of incineration. The organic contaminants are not destroyed during this extraction process; rather another treatment process would be necessary to permanently destroy the condensed liquid PCB extract. Full-scale experimental and pilot-scale thermal extraction units are available. Vendor pilot studies have reduced PCBs from an initial concentration of 18,000 ppm to less than 0.1 ppm.

Scrubber water would be treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Major applicable or relevant and appropriate requirements for thermal extraction are TSCA disposal requirements, RCRA treatment requirements, and federal and State air quality requirements. The PCB extract would be treated and disposed on-site or transported off-site for disposal, if necessary.

<u>Solidification</u>

Solidification of the excavated material involves the physical encapsulation, chemical reaction, or both, of the contaminated material. A commercially available additive is mixed with the waste to create a slurry which is allowed to harden to a solid material. This solid material can then be disposed. Solidification is used to limit the leachability, or "leaking", of the PCBs into the environment. There is no data on destruction of PCBs during the solidification process.

Because PCB volatilization during solidification is a concern, if necessary, emissions control equipment would be required. Major applicable or relevant and appropriate requirements for solidification are CAA and New York State air quality standards along with TSCA and RCRA disposal requirements. Solidified material would require cover and long-term maintenance since PCBs would not be permanently destroyed.

The treatment options discussed above can be used separately or in combination with each other to treat soils, sludges and sediments at the Site. For example, because biological treatment may not be effective on highly concentrated wastes, in the first operable unit ROD, EPA evaluated a mixed treatment alternative which involves incineration of material contaminated with PCBs over 500 ppm and biological treatment of material with PCB concentrations below 500 ppm.

Solids Containment Technologies

EPA has evaluated two types of in-place containment systems for PCB contaminated solids. These containment systems consist of two types of covers or "caps" which blanket contaminated material: a soil cover and a synthetic composite cover.

Soil Cover

The soil cover system evaluated consists of containing contaminated materials in place with a cover consisting of one layer of a synthetic geotextile material, two feet of clay and six inches of topsoil. The surface of the soil cover would then be vegetated. Prior to capping, the materials would be consolidated, compacted and graded, as necessary.

The cover would be designed to meet applicable New York State solid waste disposal requirements, CAA and New York State air quality standards, and relevant and appropriate New York State and RCRA hazardous waste disposal and closure requirements. It would not meet TSCA disposal requirements since TSCA requires a composite cover, as described below.

Composite Cover

The composite cover system evaluated consists of containing contaminated materials in place with a cap composed of the following materials: three feet of clay, one layer of flexible membrane liner, one layer of drainage material, one layer of geotextile, eighteen inches of rooting zone soil and six inches of topsoil. The surface of the composite cover would also be vegetated. Prior to capping, the materials would be consolidated, compacted and graded, as necessary.

The cover would be designed to meet applicable TSCA disposal requirements, applicable New York State waste disposal requirements, CAA and New York State air quality standards, and relevant and appropriate New York State and RCRA hazardous waste disposal and closure requirements.

Groundwater Containment Technology

EPA evaluated a slurry wall system to redirect and contain groundwater flow in the East Disposal Area and the Industrial Landfill. At the G.M. Site, the slurry wall would be installed by excavating a trench approximately forty feet deep around the area to be contained. (A depth of approximately forty feet is required to eliminate groundwater flow through the shallow, permeable lower glaciofluvial deposit which lies beneath the Industrial Landfill and the East Disposal Area (see Figure 3)). The trench would then be backfilled with a bentonite/water/soil slurry which would hold the trench open and create an impermeable barrier layer on the trench walls, which would block the flow of groundwater into and out of the contained area. Figure 5 depicts the approximate location of the slurry wall. By constructing the slurry wall so that it blocks the flow of groundwater into and out of the East Disposal Area and the Industrial Landfill and by extracting groundwater inside the slurry wall, the amount of contaminated groundwater flowing from the Site to the St. Lawrence River and Turtle Creek would be reduced.

Pumping wells would be installed inside the slurry wall to control the groundwater level inside the slurry wall and to help prevent groundwater from leaving the contained area. Monitoring wells would be placed inside and outside the slurry wall's perimeter to monitor the effectiveness of the slurry wall. The water extracted by the pumping wells inside the slurry wall would be treated in a wastewater treatment system (most likely with a combination of air stripping and carbon adsorption) to remove VOCs and PCBs. Treated water would be discharged to the St. Lawrence River in compliance with SPDES requirements.

Additional data collection would be required prior to construction of a slurry wall system at the G.M. Site (see page 40). Such data would confirm that the volume and flow rate of contaminated groundwater to be collected inside the slurry wall will be sufficient to make the slurry wall cost effective. EPA would consider alternatives to the slurry wall system if data and analysis demonstrate that the present worth costs of the slurry wall system are significantly higher than those of any proposed alternative. Any proposed alternative must, at a minimum, meet the objectives of the groundwater extraction system selected as part of the first operable unit ROD and be as protective as the slurry wall system.

The major applicable or relevant and appropriate requirements associated with the slurry wall and the pumping wells are relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels (MCLs), applicable New York State groundwater quality standards, and RCRA treatment and land disposal requirements which are applicable if the groundwater treatment residuals are RCRA hazardous wastes.

Cleanup, Treatment, and Treatment Residual Levels for the Site

EPA has chosen cleanup levels, treatment levels, and treatment residual levels for PCBs and other chemicals in the East Disposal Area and the Industrial Landfill at this Site. Cleanup levels are those levels above which some action (i.e., treatment or containment) must be implemented. Treatment levels are those levels above which treatment must be performed to reduce contaminant mobility, toxicity, or volume. Residual levels are those levels which must be met in the residual of any treatment process which is employed to remediate the Site. Second operable unit Site cleanup levels, treatment levels, and residual levels for all contaminants of concern are specified in Table 5. If necessary to ensure protection of human health and the environment, EPA may, based on the results of additional site characterization during remedial design, develop cleanup, treatment, or residual levels for other contaminants of concern.

EPA has selected a soil/sludge PCB cleanup level of 10 ppm on the G.M. facility. All soil/sludge in the East Disposal Area and the Industrial Landfill with PCB concentrations above 10 ppm must be addressed during remediation through either treatment or containment. The 10 ppm PCB cleanup level is based, in part, on EPA's risk assessment for the alternatives considered for the Site which indicates that 10 ppm is protective of human health, particularly the Mohawk population, and on EPA's August 1990 PCB guidance which recommends soil PCB cleanup levels between 10 ppm and 25 ppm in industrial areas. EPA has selected a cleanup level on the lower end of this range because access to remediated areas will be unlimited to G.M. personnel as well as to wildlife, because contaminants in on-site soils impact groundwater and surface water quality, and because surface contaminants can be transported off-site in Site runoff or as windborne dust.

EPA estimates that there are 174,000 cubic yards of sludges and soils in the East Disposal Area contaminated with PCBs above 10 ppm which are being addressed in this ROD. In addition, EPA anticipates that the estimated 424,000 cubic yards of material currently within the boundaries of the Industrial Landfill are contaminated with PCBs at concentrations above 10 ppm. Thus, EPA anticipates that the entire volume of material currently in the Industrial Landfill will be addressed in this ROD.

In general, EPA expects to use a combination of methods, including treatment and containment to address wastes at Superfund sites. Specifically, EPA expects to use treatment to address the "principal threats" posed by a site. Principal threats generally include liquids, areas with high concentrations of toxic compounds, and highly mobile materials. Further, EPA expects to use engineering controls, such as containment systems, to address waste that poses a relatively low long-term threat.

At the G.M. Site in the East Disposal Area and the Industrial Landfill, principal threats include sludge with PCB concentrations above 10 ppm, visibly oily soil with PCB concentrations above 10 ppm, and non-oily soil with PCB concentrations above 500 ppm. Sludge and visibly oily soil with PCB concentrations above 10 ppm contain significant amounts of oil and/or solvents which may mobilize PCBs and are therefore considered principal threats by EPA. Soil in the East Disposal Area and the Industrial Landfill with PCB concentrations above 500 ppm is deemed to be a principal threat in accordance with EPA's PCB Guidance which states that principal threats at industrial facilities generally include soil with PCB concentrations above 500 ppm.

Based on the available data, EPA has concluded that principal threat material in the East Disposal Area is generally segregable from material in that area which does not constitute a principal threat. Therefore, for the East Disposal Area, EPA has evaluated an alternative which includes treatment of principal threat material (i.e., sludge with PCB concentrations above 10 ppm, visibly oily soil with PCB concentrations above 10 ppm, and soil with PCB concentrations above 500 ppm) and containment of material which does not constitute a principal threat. EPA has also evaluated an alternative for the East Disposal Area with a soil/sludge treatment level of 10 ppm PCBs. By evaluating two alternatives with different treatment levels, EPA can compare alternatives associated with full and partial treatment of the East Disposal Area.

The available data indicate that the majority of the material in the Industrial Landfill is debris, foundry sand, and soil. Further, soil with PCB concentrations above 500 ppm in the Industrial Landfill is generally buried under much less contaminated material and is therefore inaccessible. Therefore, in the Industrial Landfill, EPA does not believe that segregation of principal threat material from material which does not constitute a principal threat is technically practicable. For this reason, EPA has evaluated only one soil treatment level in the Industrial Landfill, 10 ppm. By evaluating a soil treatment level of 10 ppm, EPA is comparing treatment of the entire Industrial Landfill to containment of the entire Industrial Landfill.

In general, EPA has selected a 10 ppm PCB treatment residual level for soil/sludge on the G.M. facility and a 2 ppm PCB treatment residual level for sludge with initial PCB concentrations above 500 ppm on the G.M. facility. These levels are consistent with the PCB cleanup level for the G.M. facility. This is appropriate because treated soil would be deposited on the G.M. facility after treatment. However, EPA may, in consultation with the State and the Tribe, adjust the treatment residual level upward based on the results of treatability testing in order to minimize the need to use incineration to treat G.M. Site material. For example, if the best innovative treatment technology results in a treatment residual which contains 20 ppm PCBs, EPA may determine that a treatment residual of 20 ppm PCBs is preferable to the use of incineration to achieve a treatment residual of 10 ppm or less PCBs.

TSCA regulations require that sludges with PCB concentrations above 500 ppm be incinerated in a TSCA compliant incinerator or be treated by a method equivalent to incineration. Therefore, in compliance with TSCA, the treatment residual level for any sludges with initial PCB concentrations above 500 ppm is 2 ppm rather than 10 ppm.

Any groundwater extracted from the Site would be treated to comply with SPDES requirements before it would be discharged to the St. Lawrence River. The treatment levels for groundwater are given in Table 5. These levels are based on New York State SPDES requirements which regulate the levels of contaminants which may be discharged to the waters of New York State. This is appropriate since groundwater will be discharged to the St. Lawrence River following treatment.

East Disposal Area

The remedial alternatives evaluated for the East Disposal Area include: no action, capping and groundwater containment, excavation and on-site treatment of all contaminated materials (using one of the treatment technologies outlined above), mixed treatment/containment of contaminated materials, and excavation of contaminated material with on-site disposal.

<u>Alternative E1: No Action for the East Disposal Area</u>

Capital Cost:	$ 60,000
Operation and Maintenance (O&M) Costs:	$ 127,000/year
Present Worth Cost:	$ 2 million
Time to Implement:	1 year

CERCLA requires that the "no action" alternative be considered at Superfund sites. This alternative consists of allowing the 174,000 cubic yards of contaminated soils, sludges and solids in the East Disposal Area to remain in their present state. No additional waste materials would be placed in the East Disposal Area. While periodic monitoring would be performed, no actions would be taken to remove or contain contaminated material.

Alternative E2: Capping/Groundwater Containment of the East Disposal Area

Capital Cost:	$ 2 - 4 million (without slurry wall) $ 6 - 8 million (with slurry wall)
Operation and Maintenance Costs:	$ 435,000/year (without slurry wall) $ 200,000/year (with slurry wall)
Present Worth Cost:	$ 9 - 11 million (without slurry wall) $ 9 - 11 million (with slurry wall)
Time to Implement:	4 years

This alternative consists of consolidation, compaction, and grading of 174,000 cubic yards of East Disposal Area soils with PCB concentrations above 10 ppm to provide positive surface drainage (to ensure that surface water drains from the East Disposal Area) and capping with either a soil cover or a composite cover. In addition, if warranted based on the results of additional groundwater testing, the East Disposal Area and the Industrial Landfill would be surrounded with a slurry wall. A surface water runoff collection system would also be installed around the East Disposal Area and the Industrial Landfill. Revegetation of the cover, regular cover inspection, and cover maintenance would also be required. Dust suppression measures would be implemented during cover construction.

EPA would consider alternatives to the slurry wall system if data and analysis demonstrate that the present worth costs of the slurry wall system are significantly higher than those of any proposed alternative. Any proposed alternative must, at a minimum, meet the objectives of the groundwater extraction system selected as part of the first operable unit ROD and be as protective as the slurry wall system.

Pumping wells would be installed inside the slurry wall. The water from the pumping wells and surface water runoff would be treated in a wastewater treatment system, as necessary, with a combination of air stripping to remove the volatile organic compounds and carbon adsorption to remove PCBs. Other groundwater treatment technologies could be used if further groundwater treatment is required. Treated water would be discharged to the St. Lawrence River in compliance with SPDES requirements. Deed restrictions would be placed on the G.M. property to discourage its use as a residential area in the future. Revegetation of the area and groundwater monitoring would complete the remediation. A review would be conducted within at least five years after commencement of remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

Major ARARs related to the solids containment component of this alternative are applicable TSCA disposal requirements, applicable New York State solid waste disposal requirements, and relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements. Major ARARs associated with the slurry wall and pumping wells are relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels (MCLs), applicable New York State groundwater quality standards, and RCRA treatment and land disposal requirements which are applicable if the groundwater treatment residuals are RCRA hazardous wastes.

The present worth costs of this alternative (including the costs for a slurry wall around both the East Disposal Area and the Industrial Landfill) are $ 9 million for a soil cover and $ 11 million for a composite cover. The present worth cost of this alternative excluding the costs of the slurry wall are $ 9 million for a soil cover and $ 11 million for a composite cover. These costs estimates are based, in part, on assumptions about the affect of the slurry wall on groundwater volumes given in Appendix 3. Additional data collection will be required to verify these assumptions. This alternative would require approximately four years to construct following completion of remedial design which will take approximately one year.

<u>Alternative E3: Excavation and On-Site Treatment of All Contaminated Materials in the East Disposal Area</u>

Capital Cost:	$ 33 - 86 million
Operation and Maintenance Costs:	$ 102,000 - 165,000/year
Present Worth Cost:	$ 34 - 87 million
Time to Implement:	1 - 5 years

This alternative consists of excavating 174,000 cubic yards of contaminated soil, debris and sludge in the East Disposal Area with concentrations above 10 ppm PCBs and treating them with one or a combination of the six treatment methods discussed above. In general, the goal of the treatment would be to reduce PCB concentrations below 10 ppm.

Solids would be preprocessed to reduce particle size. Large contaminated objects which could not be treated would be disposed in a facility which meets all TSCA requirements, as necessary. Treated material which is not considered under RCRA or New York State regulations would be disposed in areas on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements. Excavated areas on G.M.'s property would be covered to reduce erosion and prevent migration. These areas would be graded to prevent any surface water runoff from G.M. property and restored to support vegetation. A long-term groundwater monitoring program would also be implemented.

Major ARARs associated with this alternative are applicable TSCA disposal requirements, relevant and appropriate RCRA treatment regulations, applicable New York State solid waste disposal requirements, relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements, and CAA and New York State air quality standards.

The range of costs associated with this alternative is given in Table 6. Present worth costs range from $ 34 million to $ 87 million. Implementation times for this alternative range from one year (for solidification) to five years, depending on the type of treatment employed. These times do not include time required to design any required treatment units which will take up to two years.

<u>Alternative E4: Mixed Treatment/Containment of East Disposal Area Materials</u>

Capital Cost:	$ 20 - 33 million (without slurry wall) $ 24 - 38 million (with slurry wall)
Operation and Maintenance Costs:	$ 250,000 - 600,000/year (without slurry wall) $ 15,000 - 367,000/year (with slurry wall)
Present Worth Cost:	$ 24 - 38 million (without slurry wall) $ 24 - 38 million (with slurry wall)
Time to Implement:	1 - 3 years

This alternative consists of excavation of principal threat material in the East Disposal Area (<u>i.e.</u>, soils with PCB concentrations above 500 ppm, all sludge, and all visibly oily soil) and treatment of this material by one or a combination of the six treatment methods discussed above. In general, the principal threat material is found in the vicinity of the original disposal pit (see Figure 4). An estimated 59,000 cubic yards of material would be excavated. Due to past disposal practices, this volume includes overlying soils with PCB concentrations below 500 ppm which had been placed over material with PCB concentrations above 500 ppm or which cannot be easily separated from highly contaminated material.

The excavated material would be treated and then backfilled into the East Disposal Area to be used as grading material. In general, the goal of the treatment would be to reduce PCB concentrations below 10 ppm. Any bulk debris encountered during excavation would be stockpiled in a manner which would prevent migration of wastes from the debris. Depending on the extent and nature of its contamination, the bulk debris would, if necessary, be cleaned of gross contamination or shipped off-site for disposal in a facility licensed to accept PCB contaminated materials. The remaining untreated soil and debris in the East Disposal Area with PCB concentrations above 10 ppm (approximately 115,000 cubic yards) and the bulk debris would then be consolidated, graded to provide surface drainage, compacted, covered with a composite cover. In addition, if warranted based on the results of additional groundwater testing, the East Disposal Area and the Industrial Landfill would be surrounded by a slurry wall. A surface water runoff collection system would also be installed around the East Disposal Area and the Industrial Landfill.

EPA would consider alternatives to the slurry wall system if data and analysis demonstrate that the present worth costs of the slurry wall system are significantly higher than those of any proposed alternative. Any proposed alternative must, at a minimum, meet the objectives of the groundwater extraction system selected as part of the first operable unit ROD and be as protective as the slurry wall system.

Pumping wells would be installed inside the slurry wall. The water from the pumping wells and surface water runoff would be treated in a wastewater treatment system, as necessary, with a combination of air stripping to remove the volatile organic compounds and carbon adsorption to remove PCBs. Other groundwater treatment technologies could be used if further groundwater treatment is required. Treated water would be discharged to the St. Lawrence River in compliance with SPDES requirements. Deed restrictions would be placed on the G.M. property to discourage its use as a residential area in the future. Revegetation of the East Disposal Area and groundwater monitoring would complete the remediation. A review would be conducted within at least five years after commencement of remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

Major ARARs associated with the solids treatment component of this alternative are applicable TSCA disposal requirements, relevant and appropriate RCRA treatment regulations, applicable New York State solid waste disposal requirements, relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements, and CAA and New York State air quality standards. Major ARARs associated with the slurry wall and pumping wells are relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels (MCLs), applicable New York State groundwater quality standards, and RCRA treatment and land disposal requirements which are applicable if the groundwater treatment residuals are RCRA hazardous wastes.

Present worth costs (including the costs for a slurry wall around both the East Disposal Area and the Industrial Landfill) range from $ 24 million to $ 38 million. Present worth costs (excluding the costs of the slurry wall) range from $ 24 million to $ 38 million. These costs estimates are based, in part, on assumptions about the affect of the slurry wall on groundwater volumes given in Appendix 3. Additional data collection will be required to verify these assumptions. Implementation times for this alternative range from one year (for solidification) to three years, depending on the type of treatment employed. These times do not include time required to design any required treatment units which will take up to two years.

<u>Alternative E5: Excavation and On-Site Disposal of Solids in the East Disposal Area</u>

Capital Cost:	$ 24 million
Operation and Maintenance Costs:	$ 192,000/year
Present Worth Cost:	$ 27 million
Time to Implement:	3 years

This alternative consists of excavation of 174,000 cubic yards of contaminated soils, debris and sludges in the East Disposal Area followed by placement of these materials in an on-site double-lined landfill located on G.M. property.

A landfill would be constructed on the Site in compliance with federal and state regulations governing landfill construction. The landfill would be bermed and designed so that the base of the landfill was above the groundwater table. Contaminated material would then be excavated and transported to the on-site landfill for disposal. Following disposal, the landfill would be covered and closed according to federal and state regulations. Deed restrictions would be placed on the G.M. property to discourage its use as a residential area in the future. A review would be conducted within at least five years after commencement of remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

Excavated areas on G.M.'s property would be covered to reduce erosion and prevent migration. Maintenance of the landfill would include upkeep of the landfill cover and an access road, leachate treatment, and semi-annual groundwater monitoring. Treated leachate would be discharged to the St. Lawrence River in compliance with SPDES requirements.

Major ARARs for this alternative are RCRA closure requirements which are relevant and appropriate for the wastes at the Site, applicable New York State solid waste disposal requirements, relevant and appropriate New York State hazardous waste disposal and closure requirements, and TSCA disposal requirements which are applicable at this Site. The present worth cost of this alternative is $ 27 million. Implementation time is approximately three years following completion of remedial design which will take approximately one year.

Industrial Landfill

The remedial alternatives evaluated for the Industrial Landfill include: no action, capping and groundwater containment, excavation and on-site treatment of all contaminated materials (using one of the treatment technologies outlined above), and excavation of contaminated material with on-site disposal. EPA did not evaluate a mixed treatment/containment remedial alternative for the Industrial Landfill because EPA believes that segregation of principal threat material from material which is not a principal threat in the Industrial Landfill is technically impracticable.

<u>Alternative L1: No Action for the Industrial Landfill</u>

Capital Cost:	$ 60,000
Operation and Maintenance Costs:	$ 127,000/year
Present Worth Cost:	$ 2 million
Time to Implement:	1 year

This alternative consists of allowing the 424,000 cubic yards of contaminated material in the Industrial Landfill to remain in its present state. The interim cover installed on the Landfill would remain in place, with no upgrading of the cover. Periodic monitoring would be performed.

<u>Alternative L2: Capping/Groundwater Containment of the Industrial Landfill</u>

Capital Cost:	$ 2 - 4 million (without slurry wall) $ 6 - 8 million (with slurry wall)
Operation and Maintenance Costs:	$ 435,000/year (without slurry wall) $ 200,000/year (with slurry wall)
Present Worth Cost:	$ 9 - 11 million (without slurry wall) $ 9 - 11 million (with slurry wall)
Time to Implement:	4 years

This alternative consists of upgrading the existing interim Industrial Landfill cover with either a soil cover or a composite cover. In addition, if warranted based on the results of additional groundwater testing, the East Disposal Area and the Industrial Landfill would be surrounded by a slurry wall. A surface water runoff collection system would also be installed around the East Disposal Area and the Industrial Landfill. The existing topsoil which is part of the interim cover on the Industrial Landfill would be removed and replaced following capping.

EPA would consider alternatives to the slurry wall system if data and analysis demonstrate that the present worth costs of the slurry wall system are significantly higher than those of any proposed alternative. Any proposed alternative must, at a minimum, meet the objectives of the groundwater extraction system selected as part of the first operable unit ROD and be as protective as the slurry wall system.

The Industrial Landfill would be regraded and the slope would be adjusted to comply with RCRA requirements. In the case of the soil cover, an additional foot of compacted clay and six inches of topsoil would then be added to the Landfill. In the case of the composite cover, the following materials would be added to the Industrial Landfill following topsoil removal: one foot of clay, one layer of flexible membrane liner, one layer drainage material, one layer geotextile, eighteen inches of rooting zone soil and six inches of topsoil. Revegetation of the cover, regular cover inspection, and cover maintenance would also be required. Dust suppression measures would be implemented during cover construction.

Pumping wells would be installed inside the slurry wall. The water from the pumping wells and surface water runoff would be treated in a wastewater treatment system, as necessary, with a combination of air stripping to remove the volatile organic compounds and carbon adsorption to remove PCBs. Other groundwater treatment technologies could be used if further groundwater treatment is required. Treated water would be discharged to the St. Lawrence River in compliance with SPDES requirements. Deed restrictions would be placed on the G.M. property to discourage its use as a residential area in the future. Revegetation of the Industrial Landfill and groundwater monitoring would complete the remediation. A review would be conducted within at least five years after commencement of remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

Major applicable or relevant and appropriate requirements (ARARs) related to the solids containment component of this alternative are applicable TSCA disposal requirements, applicable New York

State solid waste disposal requirements, and relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements. Major ARARs associated with the slurry wall and pumping wells are relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels (MCLs), applicable New York State groundwater quality standards, and RCRA treatment and land disposal requirements which are applicable if the groundwater treatment residuals are RCRA hazardous wastes.

The present worth costs of this alternative (including the costs for a slurry wall around both the East Disposal Area and the Industrial Landfill) are $ 9 million for a soil cover and $ 11 million for a composite cover. The present worth costs of this alternative excluding the costs for the slurry wall are $ 9 million for a soil cover and $ 11 million for a composite cover. These costs estimates are based, in part, on assumptions about the affect of the slurry wall on groundwater volumes given in Appendix 3. Additional data collection will be required to verify these assumptions. This alternative would require approximately four years to complete following completion of remedial design which will take approximately one year.

<u>Alternative L3: Excavation and On-Site Treatment of All Contaminated Materials in the Industrial Landfill</u>

Capital Cost:	$ 61 - 202 million
Operation and Maintenance Costs:	$ 102,000 - 165,000/year
Present Worth Cost:	$ 61 - 203 million
Time to Implement:	1 - 12 years

This alternative consists of excavating the 424,000 cubic yards of contaminated soils, debris and sludges in the Industrial Landfill with PCB concentrations above 10 ppm and treating them with one of the six treatment methods discussed above. In general, the goal of the treatment would be to reduce PCB concentrations below 10 ppm.

Solids would be preprocessed to reduce particle size. Large contaminated objects which could not be treated would be disposed in a facility which meets all TSCA requirements, as necessary. Treated material which is not considered under RCRA or New York State regulations would be disposed in areas on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements. Excavated areas on G.M. property would be covered to reduce erosion and prevent migration. These areas would be graded to prevent any surface water runoff from G.M. property and restored to support vegetation. A long-term groundwater monitoring program would also be implemented.

Major ARARs associated with this alternative are applicable TSCA disposal requirements, relevant and appropriate RCRA treatment regulations, applicable New York State solid waste disposal requirements, relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements, and CAA and New York State air quality standards. The range of costs associated with this alternative is given in Table 7. Present worth costs range from $ 61 million to $ 203 million. Implementation times for this alternative range from one year (for solidification) to twelve years, depending on the type of treatment employed following completion of remedial design and treatment system construction which will take up to two years.

Alternative L4: Excavation and On-Site Disposal of Solids in the East Disposal Area

Capital Cost:	$ 32 million
Operation and Maintenance Costs:	$ 192,000/year
Present Worth Cost:	$ 34 million
Time to Implement:	3 years

This alternative consists of excavation of 424,000 cubic yards of contaminated soil, debris and sludges in the Industrial Landfill with PCB concentrations above 10 ppm followed by placement of these materials in an on-site engineered landfill located on G.M.'s property.

A landfill would be constructed on the Site in compliance with federal and state regulations governing landfill construction. The landfill would be bermed and would be designed so that the base of the landfill was above the groundwater table. Contaminated material would then be excavated and transported to the on-site landfill for disposal. Following disposal, the landfill would be covered and closed according to federal and state regulations. Deed restrictions would be placed on the G.M. property to discourage its use as a residential area in the future. A review would be conducted within at least five years after commencement of remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

Excavated areas on G.M.'s property would be covered to reduce erosion and prevent migration. Maintenance of the landfill would include upkeep of the landfill cover and an access road, leachate treatment, and semi-annual groundwater monitoring. Treated leachate would be discharged to the St. Lawrence River in compliance with SPDES requirements.

Major ARARs for this alternative are RCRA closure requirements which are relevant and appropriate for the wastes at the Site, applicable New York State solid waste disposal requirements, relevant and appropriate New York State hazardous waste disposal and closure requirements, and TSCA disposal requirements which are applicable at this Site. The present worth cost of this alternative is $ 34 million. Implementation time is approximately three years following completion of remedial design which will take approximately one year.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the National Contingency Plan (NCP), a detailed analysis of each alternative was performed. The purpose of the detailed analysis was to objectively assess the alternatives with respect to nine evaluation criteria that encompass statutory requirements and include other gauges of the overall feasibility and acceptability of remedial alternatives. The analysis was comprised of an individual assessment of the alternatives against each criterion and a comparative analysis designed to determine the relative performance of the alternatives and identify major trade-offs, that is, relative advantages and disadvantages, among them.

The nine evaluation criteria against which the alternatives were evaluated are as follows:

Threshold Criteria - The first two criteria must be satisfied in order for an alternative to be eligible for selection.

1. **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with Applicable, or Relevant and Appropriate Requirements (ARARs)** is used to determine whether each alternative will meet all of its federal and state ARARs. When an ARAR is not met, the detailed analysis should discuss whether one of the six statutory waivers is appropriate.

Primary Balancing Criteria - The next five "primary balancing criteria" are to be used to weigh major trade-offs among the different hazardous waste management strategies.

3. **Long-term Effectiveness and Permanence** focuses on any residual risk remaining at the Site after the completion of the remedial action. This analysis includes consideration of the degree of threat posed by the hazardous substances remaining at the Site and the adequacy of any controls (for example, engineering and institutional) used to manage the hazardous substances remaining at the Site.

4. **Reduction of Toxicity, Mobility, or Volume Through Treatment** is the anticipated performance of the treatment technologies a particular remedy may employ.

5. **Short-term Effectiveness** addresses the effects of the alternative during the construction and implementation phase until the remedial response objectives are met.

6. **Implementability** addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation.

7. **Cost** includes estimated capital, and operation and maintenance costs, both translated to a present worth basis. The detailed analysis evaluates and compares the cost of the respective alternatives, but draws no conclusions as to the cost effectiveness of the alternatives. Cost effectiveness is determined in the remedy selection phase, when cost is considered along with the other balancing criteria.

<u>Modifying Criteria</u> - The final two criteria are regarded as "modifying criteria," and are to be taken into account after the above criteria have been evaluated. They are generally to be focused upon after public comment is received.

8. **State and Tribe Acceptance** reflects the statutory requirement to provide for substantial and meaningful State and Tribal involvement.

9. **Community Acceptance** refers to the community's comments on the remedial alternatives under consideration, along with the Proposed Plan. Comments received during the public comment period, and the EPA's responses to those comments, are summarized in the Responsiveness Summary which is attached to this ROD.

The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria.

Overall Protection of Human Health and the Environment

With the exception of the no action alternative for the East Disposal Area, Alternative E1, each of the alternatives for the East Disposal Area and Industrial Landfill, if properly implemented, operated, and maintained, protects human health and the environment. Although the alternatives differ in the degree of protection they afford, all reduce excess carcinogenic health risks to humans to levels within the acceptable EPA range of 10^{-4}

to 10^{-6}. The risks associated with Alternative L1, the no action alternative for the Industrial Landfill, are acceptable, in part, because the interim cap placed on the Industrial Landfill in 1988 has been effective thus far. It should be noted, however, that this interim measure is not considered to be protective of human health in the long-term.

Since Alternative E1, the no action alternative for the East Disposal Area, is not protective, it will not be considered in the remainder of this analysis.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

With the exception of the no action alternatives, all alternatives comply with ARARs or provide the grounds for invoking an ARAR waiver as noted below.

<u>Alternative E3: Excavation and On-Site Treatment of All Contaminated Materials in the East Disposal Area</u> and <u>Alternative L3: Excavation and On-Site Treatment of All Contaminated Materials in the Industrial Landfill</u>

According to TSCA disposal regulations and policy, all treatment residuals with PCB concentrations above 2 ppm must be disposed in a TSCA chemical waste landfill. However, EPA anticipates disposing of treatment residuals on G.M. property in a disposal facility which will include, at a minimum, a vegetated soil cap. EPA anticipates that treatment residuals will generally have PCB concentrations below 10 ppm. Therefore, depending on the type of disposal facility ultimately selected during design, these alternatives require that, in accordance with TSCA regulations (40 CFR 761.75(c)(4)), EPA waive certain TSCA chemical waste landfill requirements for treatment residuals with PCB concentrations above 2 ppm. These TSCA chemical landfill requirements would be waived because treatment residuals which generally have PCB concentrations below 10 ppm do not present an unreasonable risk of injury to health or the environment from PCBs. EPA bases this finding on its risk assessment and the EPA August 1990 PCB guidance which indicate that 10 ppm is protective of human health at the Site.

In addition, TSCA regulations require that sludges with PCB concentrations above 500 ppm be incinerated in a TSCA compliant incinerator or be treated by a method equivalent to incineration. In compliance with TSCA, any sludges with initial PCB concentrations above 500 ppm which cannot be treated by an innovative technology to achieve PCB residuals below 2 ppm must be incinerated.

Alternative L1: No Action for the Industrial Landfill, Alternative E2: Capping/Groundwater Containment of the East Disposal Area, Alternative L2: Capping/Groundwater Containment of the Industrial Landfill, and Alternative E4: Mixed Treatment/Containment of East Disposal Area Materials

New York State groundwater quality standards for PCBs require that Site groundwater be remediated to reduce PCB concentrations to 0.1 ppb. However, the small volume of groundwater beneath the Site in the area between the St. Lawrence River and the slurry wall in these alternatives (see Figure 5) may not meet New York State standards. This is due to the fact that, although the slurry wall will be located as close to the St. Lawrence River as possible, it will not capture contaminated groundwater outside its perimeter. If, after implementation of the remedy for the G.M. Site, it is technically impracticable to collect and/or treat this small volume of groundwater, EPA would be required to waive New York State groundwater quality standards in groundwater between the slurry wall and the St. Lawrence River on the grounds that they are technically impracticable to achieve in that area.

In addition, the Industrial Landfill interim cover and the soil cover options for the East Disposal Area and Industrial Landfill do not comply with relevant and appropriate TSCA and RCRA hazardous waste landfill closure requirements.

Long-Term Effectiveness and Permanence

In general, remedies which include excavation and treatment (e.g., Alternatives E3, E4, and L3) are more permanent and effective over the long-term than remedies which include containment. Containment and capping remedies (i.e., Alternatives E2, E5, L2, and L4) provide a lower degree of permanence in remediating contamination at the Site since contaminated material would be left on-site indefinitely. Thus, the more treatment included in an alternative, the better that alternative meets this criterion. For this reason, excavation and on-site treatment of all contaminated materials in the East Disposal Area and Industrial Landfill (Alternatives E3 and L3) best meet this criterion. However, Alternative E4, mixed treatment/containment of the East Disposal Area, includes treatment of the principal threat in the East Disposal Area and, therefore, also meets this criterion.

Alternatives E5 and L4, excavation and on-site disposal of solids in the East Disposal Area and the Industrial Landfill without treatment, is much less permanent than treatment of contaminated material in these areas. The long-term effectiveness of groundwater containment (i.e., Alternatives E2, E4, and L2) depends on the stability of the slurry wall (or the groundwater extraction system if no slurry wall is required). Long-term monitoring and maintenance of covered areas would be required and these areas would not be usable once capped.

With respect to the treatment alternatives, Alternatives E3, E4, and L3, incineration is a permanent and effective technology since it results in destruction of PCBs. Of all the technologies considered, it is likely that incineration will meet required treatment levels.

Chemical extraction, biological treatment, chemical destruction and thermal extraction technologies have the potential to permanently remediate the Site; however, uncertainties exist because these technologies have not been proven in the past. Treatability studies would be necessary during the design phase to ensure long-term effectiveness of these alternatives. Recent G.M. tests of biological treatment have not resulted in PCB reductions which meet the Site soil/sludge residual level of 10 ppm. Solidification is less permanent than other treatment technologies considered and solidified material would require long-term management.

Reduction of Toxicity, Mobility or Volume (through Treatment)

Biological treatment, chemical destruction, and thermal destruction (contained in Alternatives E3, E4, and L3) perform best with respect to this criterion because they reduce toxicity, mobility, and volume of contaminants through treatment. Chemical and thermal extraction reduce the volume of toxic contaminants. Further treatment of the extracted toxic material reduces toxicity and mobility of the contamination. Solidification reduces only the mobility of toxic contaminants. For this reason, solidification is the treatment technology which performs worst with respect to this criterion. Containment alternatives and alternatives that do not include treatment (i.e., Alternatives E2, E5, L2, and L4) do not meet this criterion; although containment alternatives can reduce contaminant mobility, they do not employ treatment to do so.

Short-Term Effectiveness

Solids containment alternatives which can be implemented quickly with moderate amounts of dust generation perform best with respect to this criterion. Thus, capping of the East Disposal Area and the Industrial Landfill without excavation and treatment of contaminated material (i.e., Alternatives E5 and L4) are the alternatives which are most effective in the short term. Any alternatives which incorporate Site excavation, such as treatment alternatives (Alternatives E3, E4, and L3) or alternatives which include slurry wall construction (Alternatives E2, E4, and L2), would be accompanied by an increase in dust generation during excavation. Although mitigative measures would be used, the emission of contaminated dust during excavation is much greater than during containment activities where the contaminated soils would remain relatively undisturbed.

Because the effectiveness of biological treatment in treating PCBs is relatively unproven, implementation of this technology could take longer than implementation of other treatment technologies. Biological treatment, thermal destruction, chemical destruction, thermal extraction, and solidification (as found in Alternatives E3, E4, and L3) result in air emissions which will have a short-term effect on the community and Site workers. The short-term excess cancer risks to the adult Mohawk population during implementation of certain remedial alternatives are presented in Table 8. Community and worker exposure would be minimized by the use of construction methods that minimize air emissions and surface water runoff; also, protective equipment that minimizes workers' contact with the contaminated materials would be utilized. Air quality would be monitored during remediation. Risks to G.M. workers would be lower than those for remediation workers.

The population downwind of the G.M. facility and G.M. workers could be impacted by excavation of the East Disposal Area and/or Industrial Landfill and emissions from treatment equipment; precautions to minimize potential impacts will be included in the design phase for the remediation of the Site. If necessary, these precautions may include temporary relocation of Raquette Point residents. Any impacted areas will be restored after excavation, if necessary. Residual impacts to adjacent wetlands may remain after excavation.

Completion of pilot treatability studies, remedial design, and treatment system construction will take up to two years. The time required to treat all East Disposal Area material would range between one and ten years, depending on the type of treatment employed. (Solidification could be accomplished in approximately one year.) The time required to treat all Industrial Landfill material would range between one and 15 years, depending on the type of treatment employed. A combination of treatment and containment for East Disposal Area material (Alternative E4) would require one to three years to complete after design, depending on the type of treatment selected. Industrial Landfill containment (including slurry wall construction) could be completed in two years.

Implementability

All of the alternatives are implementable from an engineering standpoint. However, there are some inherent difficulties which may be encountered during implementation of some alternatives. Generally, alternatives which include in-place containment of wastes involve less materials handling than alternatives which include excavation and treatment of wastes; they are therefore easier to implement. Thus, Alternatives E2, and L2, capping with groundwater containment in the East Disposal Area and the Industrial Landfill without excavation and treatment of contaminated material, are the alternatives which are most easily implemented. Accordingly, Alternative E4, mixed treatment/containment in the East Disposal Area, is easier to implement than Alternatives E3, E5, and L3, excavation and treatment or on-site disposal of all contaminated materials in the East Disposal Area and Industrial Landfill.

Construction of the slurry wall in Alternatives E2, E4, and L2, while implementable, may present some difficulties. For instance, precautions must be taken to ensure that wastes are not disturbed during slurry wall related excavation in the vicinity of the East Disposal Area and Industrial Landfill. Such wastes, if disturbed, could contaminate groundwater in these areas. In addition, the slurry wall must be designed to ensure that it does not serve as a conduit which introduces contamination at depth into previously uncontaminated aquifers.

Excavation in the East Disposal Area (e.g., in Alternatives E3, E4, and E5) could be hampered by the large boulders and pieces of concrete, foundry equipment, and demolition debris which are visible on the surface of the East Disposal Area. Similarly, significant amounts of debris could be unearthed during excavation of some areas of the East Disposal Area. During investigations of the G.M. Site, several soil borings in the East Disposal Area showed the presence of debris.

Alternatives E3, E4, and L3 will require treatability studies to optimize the design and operating parameters for the treatment system. EPA intends that the results of the first operable unit treatability testing program will satisfy most, if not all, of the treatability testing data requirements for the entire G.M. Site such that additional treatability studies will not be required during design of the second operable unit remedy. Because the effectiveness of biological treatment in treating PCBs is relatively unproven, the implementability of this technology could be lower than that of other treatment technologies. If innovative technologies are not found to be implementable, other more proven technologies, such as incineration, could be used to treat soils, sludges and sediments. Full-scale equipment and vendors are available for chemical destruction, chemical extraction, thermal destruction, and solidification.

Cost

The costs associated with the alternatives were presented in the discussion of each alternative and in Tables 6 and 7. These costs are estimates and may change as a result of design and construction modifications. Remedial costs for the East Disposal

Area range from $ 9 million (for containment with a soil cover) to $ 87 million (for incineration of all material in the East Disposal Area). Remedial costs for the Industrial Landfill range from $ 9 million for containment with a soil cover) to $ 203 million (for incineration of all material in the Industrial Landfill).

Capital costs include fixed costs (costs associated with equipment mobilization and Site preparation) and non-fixed costs (costs associated with treatment of a specific disposal area). Capital costs are only incurred once for each treatment technology. Thus, significant savings (in fixed costs) from those costs displayed in the Tables 6 and 7 will result whenever the same treatment technology is used for two different disposal areas on the G.M. Site.

State and Tribe Acceptance

New York State has expressed a preference for permanent remedies which include excavation and permanent treatment of the majority (on the order of 90%) of the PCB mass at the Site. The St. Regis Mohawk Tribe has indicated that its primary concerns are protection of the Mohawk people's health and environment through expeditious cleanup of the Site. To this end, they support the permanent treatment of all contaminated material in the East Disposal Area and Industrial Landfill and comprehensive controls which ensure that there will be no further migration of contamination from the G.M. Site onto the Reservation or into the waters utilized by the Mohawk people.

The Site, as defined by EPA, presents unique dangers to the resources and people of the St. Regis Mohawk Tribe who have a cultural and spiritual link to the St. Lawrence environment. Special consideration must be given to Native American concerns in evaluating and remediating the Site. The Tribe views all containment remedies as interim measures only.

Community Acceptance

Comments from the community submitted during the public comment period indicate that the community has varying opinions regarding remediation of the East Disposal Area and Industrial Landfill at the Site. Many citizens, including many Mohawks, expressed a desire for complete removal and treatment of all contamination at the Site. Other citizens, many of them residents of Massena, supported a G.M. plan for Site remediation which included containment of the Industrial Landfill and the East Disposal Area. Community comments are responded to in detail in the Responsiveness Summary which is an appendix to this document.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedy for the second operable unit include:

> Excavation and permanent treatment of soil containing PCBs at concentrations at or above 500 parts per million, all sludge, and all visibly oily soil from the East Disposal Area at the Site
>
> Non-oily soil with PCB concentrations above 500 ppm, all sludge, and all visibly oily soil will be excavated from the East Disposal Area and treated to permanently destroy PCBs and other contaminants. An estimated 59,000 cubic yards of material will be excavated and treated. Due to past disposal practices, this volume may include non-oily soil with PCB concentrations below 500 ppm which cannot be segregated from principal threat material.
>
> The type of treatment to be used will be determined on the basis of treatability tests during design of the first operable unit remedy. In general, the goal of the treatment process will be to reduce PCB concentrations below 10 ppm PCBs (see residual levels in Table 5). If any material cannot be treated to meet the treatment residual level using biological treatment alone, incineration or one of the other innovative technologies tested during design which has been demonstrated to achieve Site treatment goals will be used to treat it. If necessary to ensure protection of human health and the environment, EPA will, based on the results of additional site characterization during remedial design, develop cleanup, treatment, or residual levels for other contaminants of concern.
>
> During remediation, surface water runoff will be collected, treated, if necessary, and discharged to the St. Lawrence River in compliance with SPDES requirements to minimize off-site migration of contaminants via runoff. Bulk items which are not amenable to treatment will be separated, stockpiled and disposed in a facility which meets all TSCA requirements, as necessary. EPA may elect not to excavate parts of the East Disposal Area if debris, boulders, cobbles, or other bulk items make excavation technically impracticable. Treated soils will be backfilled in the East Disposal Area, used to grade the remainder of the untreated material in the East Disposal Area, and covered with a composite cap. The East Disposal Area will be maintained permanently.

Prior to remediation, a wetlands assessment, floodplains assessment, cultural resources survey, and a statement of consistency with the New York Coastal Zone Management Program will be required.

Consolidation and in-place containment of less contaminated soils (with PCB concentrations below 500 ppm) in the East Disposal Area at the Site

Non-oily soil with PCB concentrations above 10 ppm and below 500 ppm in the East Disposal Area will be consolidated, regraded, and contained using a composite cover. Approximately 115,000 cubic yards of material will be contained in the East Disposal Area along with treated soils backfilled in the East Disposal Area and bulk debris. The East Disposal Area cover will be maintained permanently. Groundwater and air will be monitored to ensure that PCBs and other contaminants are not migrating from the East Disposal Area. Monitoring will continue as long as contaminants are present in the East Disposal Area. The containment area will be fenced and marked consistent with TSCA regulations.

Recontouring, regrading and containment of contaminated material in the Industrial Landfill

The estimated 424,000 cubic yards of contaminated material in the Industrial Landfill will be contained with a composite cover. The Industrial Landfill will be regraded and the slope will be adjusted to comply with federal and state requirements. The following materials will be added to the Industrial Landfill following topsoil removal: one foot of clay, one layer of flexible membrane liner, one layer drainage material, one layer geotextile, eighteen inches of rooting zone soil and six inches of topsoil. Revegetation of the cover will be required. The cover will be maintained. Groundwater and air will be monitored to ensure that PCBs and other contaminants are not migrating from the Industrial Landfill. Monitoring will continue as long as contaminants are present in the Industrial Landfill. The containment area will be fenced and marked consistent with TSCA regulations.

PCB sludge, oily PCB contaminated soil, or non-oily soil hotspots containing greater than 500 ppm PCBs may be exposed during Landfill regrading and slope adjustment. If any of these materials are encountered, they will be treated in a manner similar to comparable material excavated from the East Disposal Area. During remediation, surface water runoff will be collected, treated, if necessary, and discharged to the St. Lawrence River in compliance with

SPDES requirements to minimize off-site migration of contaminants via runoff.

Deed restrictions will be placed on G.M.'s property to discourage its use as a residential area in the future. Because PCB contaminated soils will remain on-site in the East Disposal Area and the Industrial Landfill, a review will be conducted within five years after construction begins, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

<u>Control of groundwater migration from the East Disposal Area and Industrial Landfill through the use of a slurry wall</u>

Contingent upon the results of additional data collection (as further explained below), the East Disposal Area and Industrial Landfill will be surrounded by a slurry wall (see Figure 5) and runoff collection system. Pumping wells will be installed inside the slurry wall. A comprehensive surface water control system (including surface water runoff collection, treatment, if necessary, and discharge to the St. Lawrence River in compliance with SPDES requirements) will be installed to ensure that contaminants are not migrating off-site via runoff. The water from the pumping wells and any surface water runoff will be treated, as necessary, in a wastewater treatment system with a combination of air stripping to remove volatile organic compounds and carbon adsorption to remove PCBs. Treated water will be discharged to the St. Lawrence River in compliance with State SPDES requirements. During and after remediation, groundwater and surface water will be monitored.

EPA will consider alternatives to the slurry wall system if data and analysis demonstrate that the present worth costs of the slurry wall system are significantly higher than those of any proposed alternative. Any proposed alternative must, at a minimum, meet the objectives of the groundwater extraction system selected as part of the first operable unit ROD and be as protective as the slurry wall system.

Based on the currently available data, EPA believes that the slurry wall will prove cost-effective because it will significantly reduce the volume of contaminated groundwater which will be extracted from the Site. EPA estimates that, without a slurry wall, the volume of contaminated groundwater that will need to be collected downgradient of the Industrial Landfill is on the order of 2,000,000 gallons per year. By comparison, EPA estimates that the volume of contaminated groundwater which would be collected within the slurry wall (assuming no recharge from beneath the slurry wall or from the St. Lawrence River) is on the order of 150,000 gallons per year. If data taken during design prove that these estimates are essentially correct, then the additional costs associated with construction of the slurry wall would be offset within 10 years by the savings in water treatment costs. An estimate of the cost savings is presented in Appendix 3.

Testing of other PCB treatment technologies

As part of the first operable unit ROD, other innovative PCB treatment technologies are to be tested concurrently with biological destruction so that EPA will have additional information in the event that biological destruction proves to be unsatisfactory for treatment of any Site material. EPA intends that the results of the first operable unit treatability testing program will satisfy most, if not all, of the treatability testing data requirements for the entire G.M. Site such that additional treatability studies will not be required during design of the second operable unit remedy.

Biological treatment or an innovative treatment technology will be used wherever EPA determines it to be viable and implementable. In the event that biological treatment will require a prolonged period to implement or is ineffective in attaining the Site soil/sludge residual level (given in Table 5) for a certain area of the Site or for certain Site materials, other innovative PCB treatment technologies (which have been demonstrated to achieve Site treatment goals during the first operable unit treatability testing program) or incineration may be employed. The criteria used to judge the treatment technologies during treatability testing include effectiveness, time to full-scale implementation, and cost. EPA will select the treatment technologies to be employed, in consultation with NYSDEC and the St. Regis Mohawk Tribe.

The total present worth cost of the second operable unit selected remedy ranges from \$ 31 - \$ 45 million, depending on the type of treatment implemented for East Disposal Area material. These costs do not include the \$ 78 million associated with the first operable unit remedy. A breakdown of estimated costs associated with the selected remedy is presented in Table 9.

STATUTORY DETERMINATIONS

Protection of Human Health and the Environment

The selected remedy protects human health and the environment through the permanent treatment of the principal threat material in the East Disposal Area and through containment of less contaminated material and groundwater. The interim cap on the Industrial Landfill is currently protective of human health and the environment but does not meet ARARs. Treatment residuals will be covered. Bulk items which are not amenable to treatment will be separated, stockpiled, and disposed in a facility which meets all TSCA requirements, as necessary. Following implementation of the first and second operable unit selected remedy, the excess cancer risk to the adult Mohawk population will be on the order of 10^{-7}.

Compliance with ARARs

A list of ARARs for the selected remedy is presented in Table 10. The selected remedy complies with these ARARs or provides the grounds for invoking a waiver as described below.

According to TSCA disposal regulations and policy, soil treatment residuals with PCB concentrations above 2 ppm must be disposed in a TSCA chemical waste landfill. However, in accordance with TSCA regulations, EPA is waiving certain TSCA chemical waste landfill requirements for East Disposal Area soil treatment residuals with PCB concentrations above 2 ppm, provided they meet the Site treatment residual goal of 10 ppm. Specifically, provided the residuals are soils with a low water content and PCB concentrations below 10 ppm (or a higher level if, based on the results of treatability testing, EPA deems such a level is warranted in order to minimize the use of incineration at the Site), EPA is waiving the TSCA requirements regarding landfill location and the TSCA requirement for a leachate collection system. These TSCA chemical landfill requirements are being waived under TSCA (40 CFR 761.75(c)(4)) because soil treatment residuals which meet Site cleanup standards do not present an unreasonable risk of injury to health or the environment from PCBs.

According to New York State hazardous waste disposal regulations at 6 NYCRR Part 370, all treatment residuals which satisfy the New York State definition of hazardous waste must be disposed in a landfill which meets New York State requirements. EPA does not anticipate that treatment residuals will be hazardous (e.g., have PCB concentrations above 10 ppm). However, all treatment residuals will be considered solid waste under New York State regulations at 6 NYCRR Part 360. New York State solid waste regulations, while mandating several requirements, including the use of a liner and leachate collection system, allow for less stringent requirements based on the "potential pollution" of the waste (6 NYCRR Part 360-2.14(a)).

During design, plans will be finalized for the disposal of residuals. These plans will include certain provisions to ensure proper residuals disposal. Further, the residuals will be placed in a manner to ensure that they are not in contact with the shallow groundwater aquifer. The cap will be constructed and maintained to prevent erosion and graded to direct runoff from the capped area. Should certain treatment residuals be hazardous or require greater protection than discussed above, EPA in consultation with New York State and the St. Regis Mohawk Tribe, will impose appropriate requirements in the finalized residuals treatment and disposal design plans.

In addition, TSCA regulations require that sludges with PCB concentrations above 500 ppm be incinerated in a TSCA compliant incinerator or be treated by a method equivalent to incineration. In compliance with TSCA, any East Disposal Area sludges with initial PCB concentrations above 500 ppm which cannot be treated by an innovative technology to achieve PCB residuals below 2 ppm will be incinerated.

New York State groundwater quality standards for PCBs require that Site groundwater be remediated to reduce PCB concentrations to 0.1 ppb. However, the small volume of groundwater beneath the Site in the area between the St. Lawrence River and the slurry wall in these alternatives (see Figure 5) may not meet New York State standards. This is due to the fact that, although the slurry wall will be located as close to the St. Lawrence River as possible, it will not capture contaminated groundwater outside its perimeter.

EPA has therefore determined and is hereby documenting that, after implementation of the remedy for the G.M. Site, if it is technically impracticable to collect and/or treat this small volume of groundwater, EPA will waive New York State groundwater quality standards in groundwater between the slurry wall and the St. Lawrence River on the grounds that they are technically impracticable to achieve in that area. Because EPA has documented its use of such a waiver in this ROD, further public notification of the waiver will not be required. However, EPA will consult with New York State and the St. Regis Mohawk Tribe regarding the use of the technical impracticability waiver for groundwater.

Cost Effectiveness

The selected remedy is cost effective because it has been demonstrated to provide overall effectiveness proportional to its costs. The present worth of the selected alternative is $ 31 - 45 million. EPA has selected an alternative which includes the use of innovative technologies (if they prove effective in treating East Disposal Area material) and, as a last resort, incineration. This is a cost effective remedy since innovative technologies are generally less expensive than incineration.

Mixed treatment/containment of the East Disposal Area is approximately three times more expensive than containing all East Disposal Area material. However, this is a cost effective remedy since EPA estimates it will result in a significant reduction, on the order of 90%, in PCB mass in the East Disposal Area. The selected East Disposal Area remedy is also cost effective compared to treatment of all East Disposal Area material. Treatment of all East Disposal Area material would add another $ 4 million to $ 57 million to remedial costs; however, the additional costs would result in treatment of only the remaining 10% of the PCB mass in the East Disposal Area.

Containment of the Industrial Landfill is cost effective since the interim cap on the Industrial Landfill is currently protective of human health and the environment. The upgrading of the Landfill cap is thus the most cost effective way to comply with federal and State ARARs.

EPA will consider alternatives to the slurry wall system if data and analysis provided demonstrate that the present worth costs of the slurry wall system are significantly higher than those of any proposed alternative. Any proposed alternative must, at a minimum, meet the objectives of the groundwater extraction system selected as part of the first operable unit ROD and be as protective as the slurry wall system.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost effective manner for the second operable unit at the G.M. Site. Of those alternatives that are protective of human health and the environment and meet ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, and volume through treatment, short-term effectiveness, implementability, and cost while also considering the statutory preference for treatment as a principal element and considering State, Tribe and community acceptance.

The selected remedy for the East Disposal Area offers a higher degree of permanence than containment alternatives. Because PCBs are highly persistent in the environment, removal and treatment of principal threat material provides the most effective way of assuring long-term protection. In addition, the use of biological treatment (or another innovative treatment technology) or incineration) and groundwater treatment results in the reduction of toxicity and mobility of PCBs. Although there are short-term impacts associated with the selected remedy, these can be mitigated and will not pose an unacceptable risk to the surrounding community, G.M. workers, or remediation workers.

Biological treatment and the other innovative treatment technologies present some difficulties in implementation since they must be tested during design. However, incineration is a proven technology for the destruction of PCBs which can be used if necessary to ensure destruction of contaminated materials. Biological treatment is the least costly of all treatment alternatives evaluated. Therefore, use of biological treatment where it is effective minimizes the cost of the selected alternative provided treatability tests show that it performs in a manner comparable to the other technologies considered. In addition, EPA favors the development of innovative technologies.

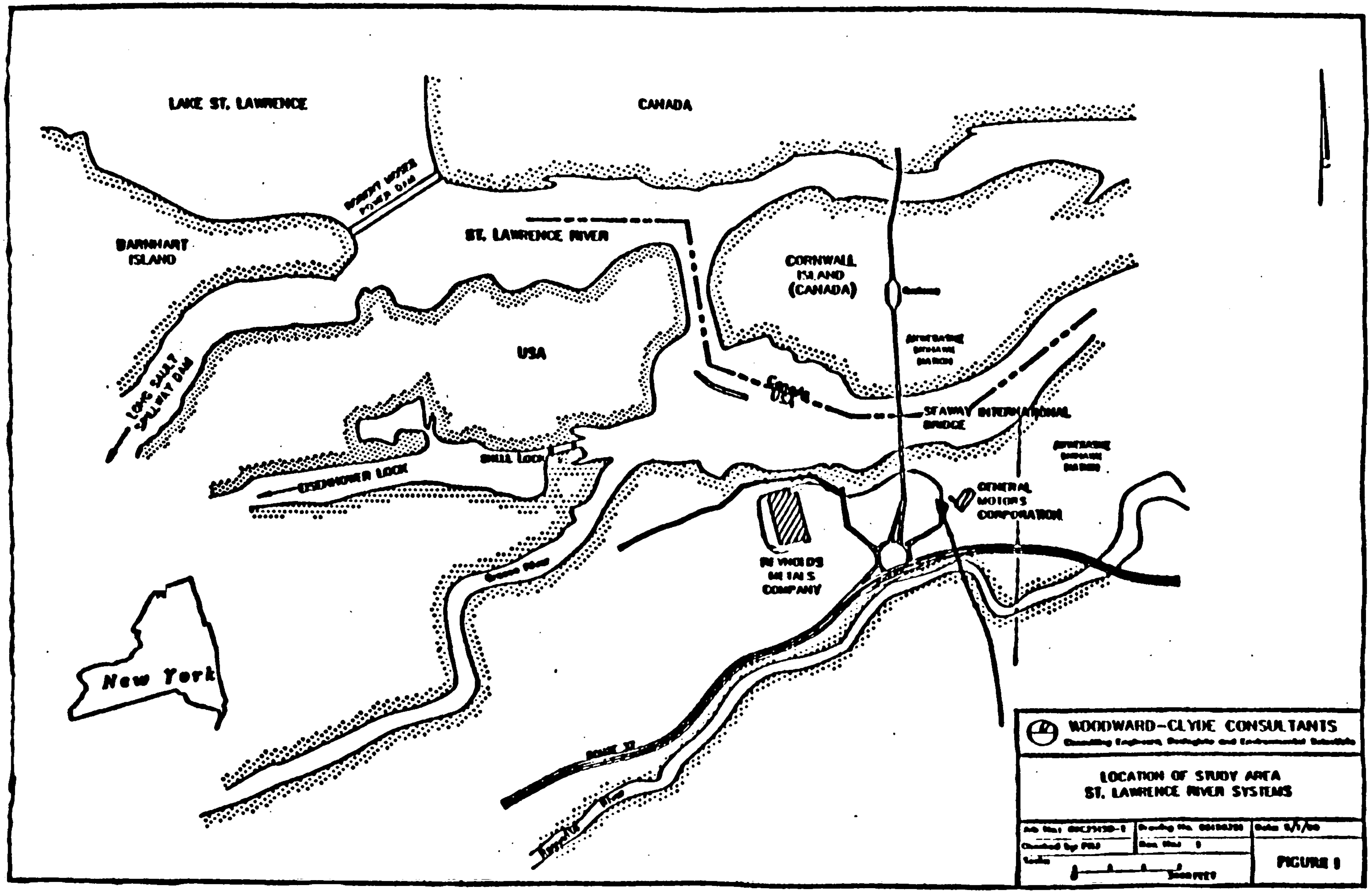
The selection of treatment is consistent with Superfund program expectations that highly toxic, persistent wastes are a priority for treatment which ensures long-term effectiveness. The selection of containment for less toxic, less mobile material in the East Disposal Area and for the Industrial Landfill is consistent with the Superfund program expectation that engineering controls be used to address material that poses a relatively low long-term threat or where treatment is impracticable. Highly contaminated material in the Industrial Landfill is inaccessible. In addition, the Industrial Landfill poses no current risk to human health or the environment. Groundwater containment using a slurry wall is an effective way of minimizing off-site migration of contaminated groundwater to the St. Lawrence River system or to the St. Regis Mohawk Reservation.

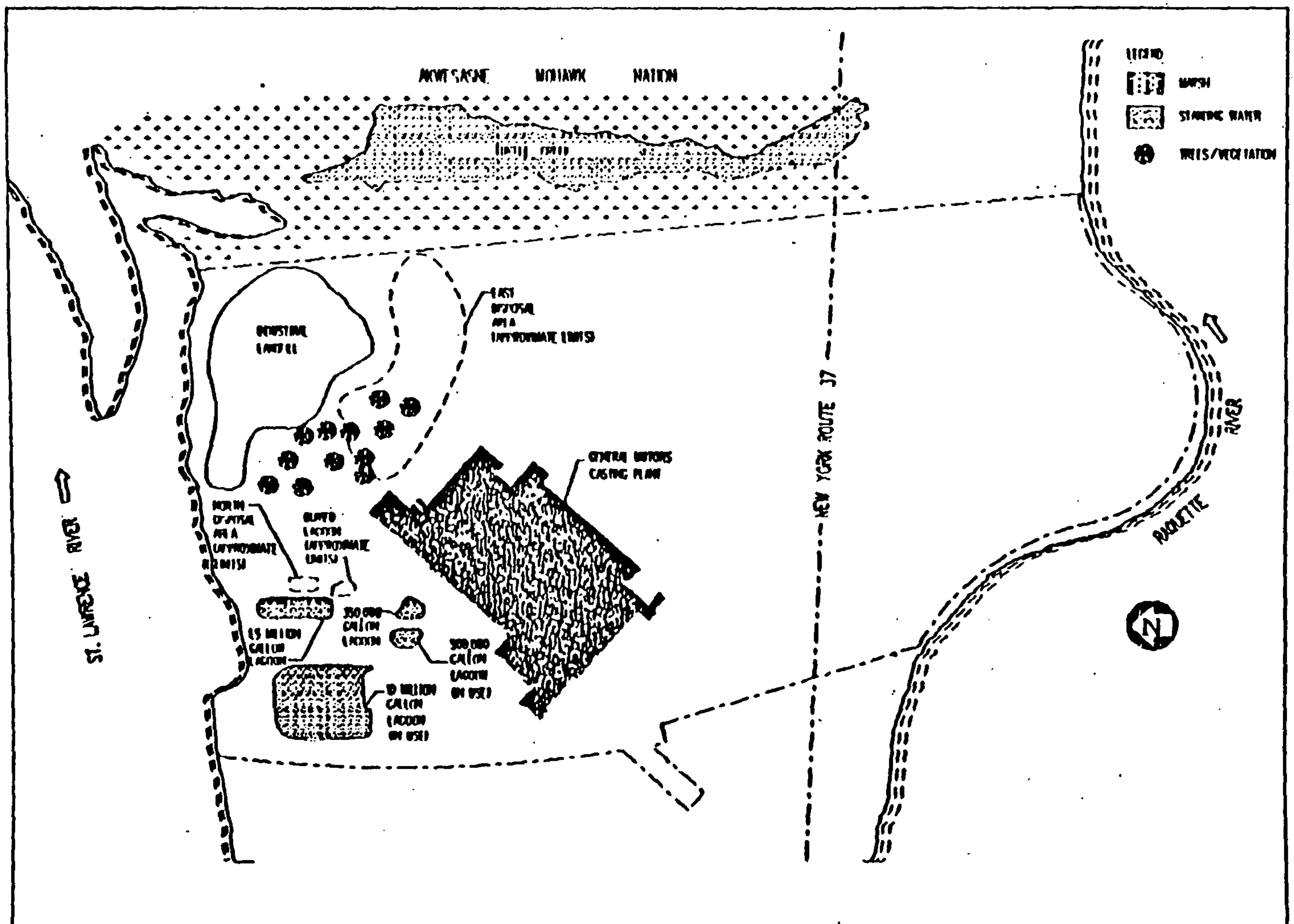
Preference for Treatment as a Principal Element

By treating non-oily soil with PCB concentrations above 500 ppm, all sludge, and all visibly oily soil in the East Disposal Area, the selected remedy satisfies the statutory preference for remedies that employ treatment as a principal element for the principal threat posed by the East Disposal Area and Industrial Landfill at the Site.

APPENDIX 1

FIGURES


LAKE ST. LAWRENCE
CANADA
BARNHART ISLAND
ST. LAWRENCE RIVER
CORNWALL ISLAND (CANADA)
USA
LONG SAULT SPILLWAY DAM
EISENHOWER LOCK
SNELL LOCK
SEAWAY INTERNATIONAL BRIDGE
GENERAL MOTORS CORPORATION
REYNOLDS METALS COMPANY
New York
WOODWARD-CLYDE CONSULTANTS
LOCATION OF STUDY AREA
ST. LAWRENCE RIVER SYSTEMS
FIGURE 1



G.M SITE PLAN

FIGURE 2

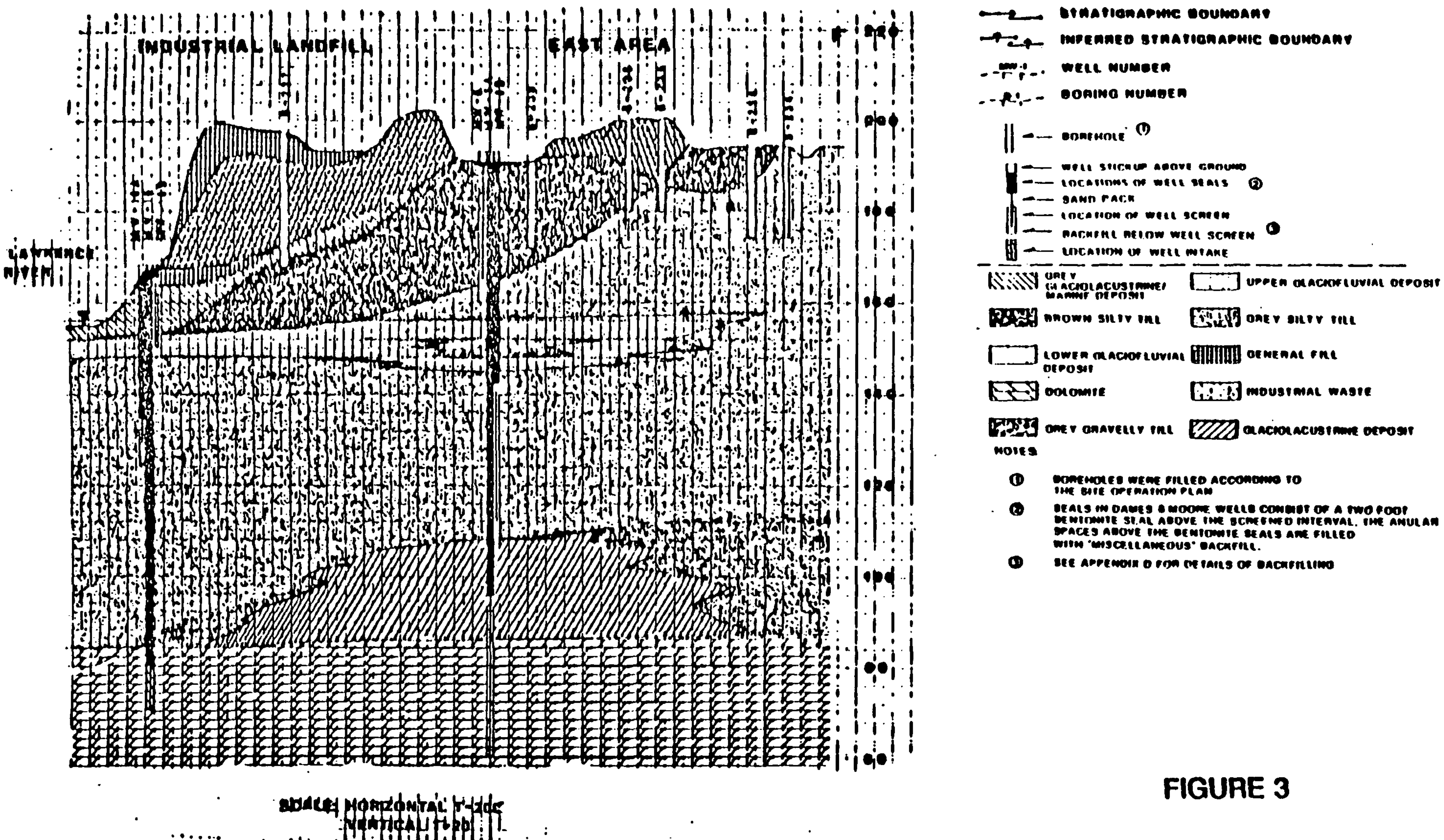
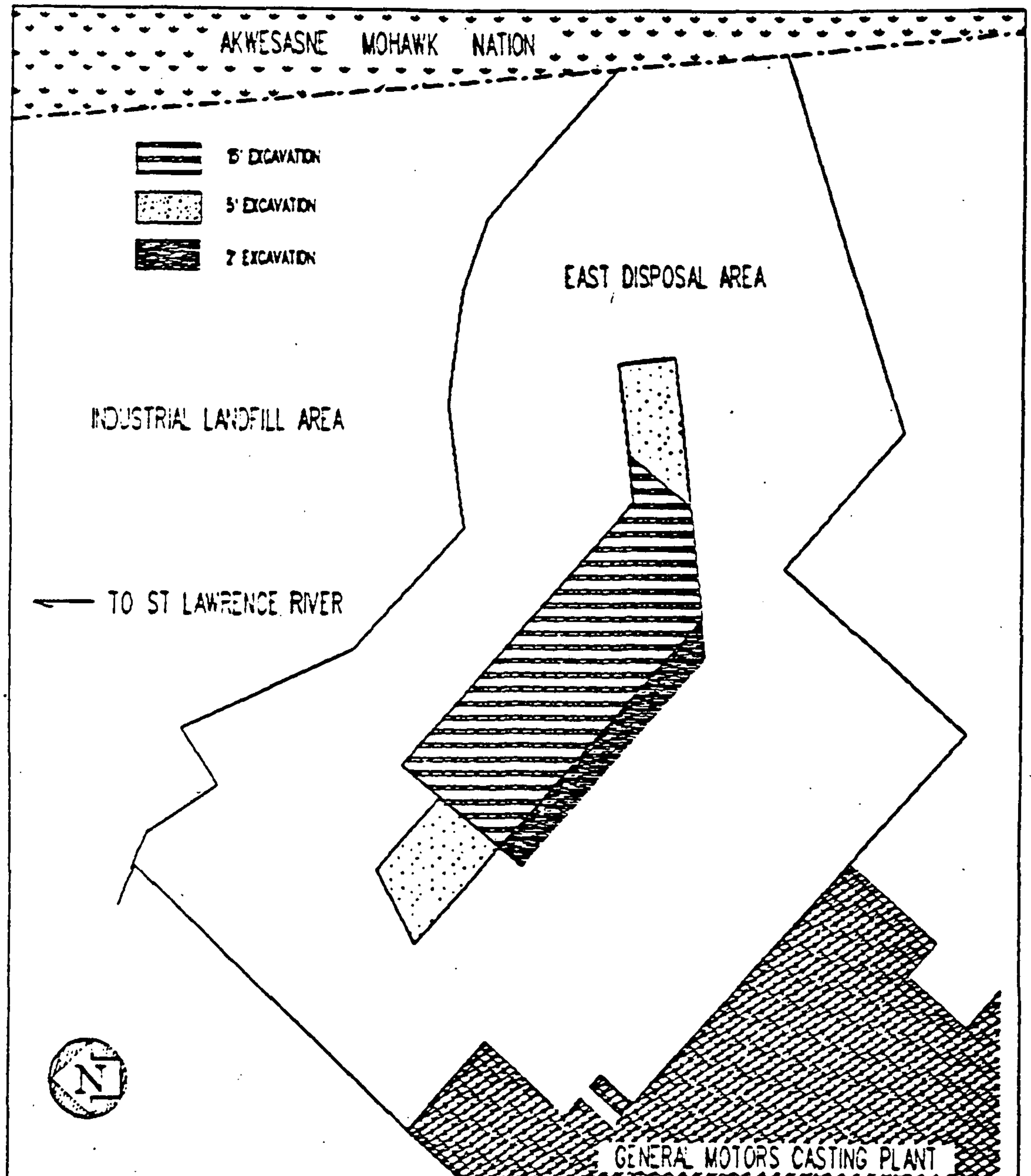


FIGURE 3

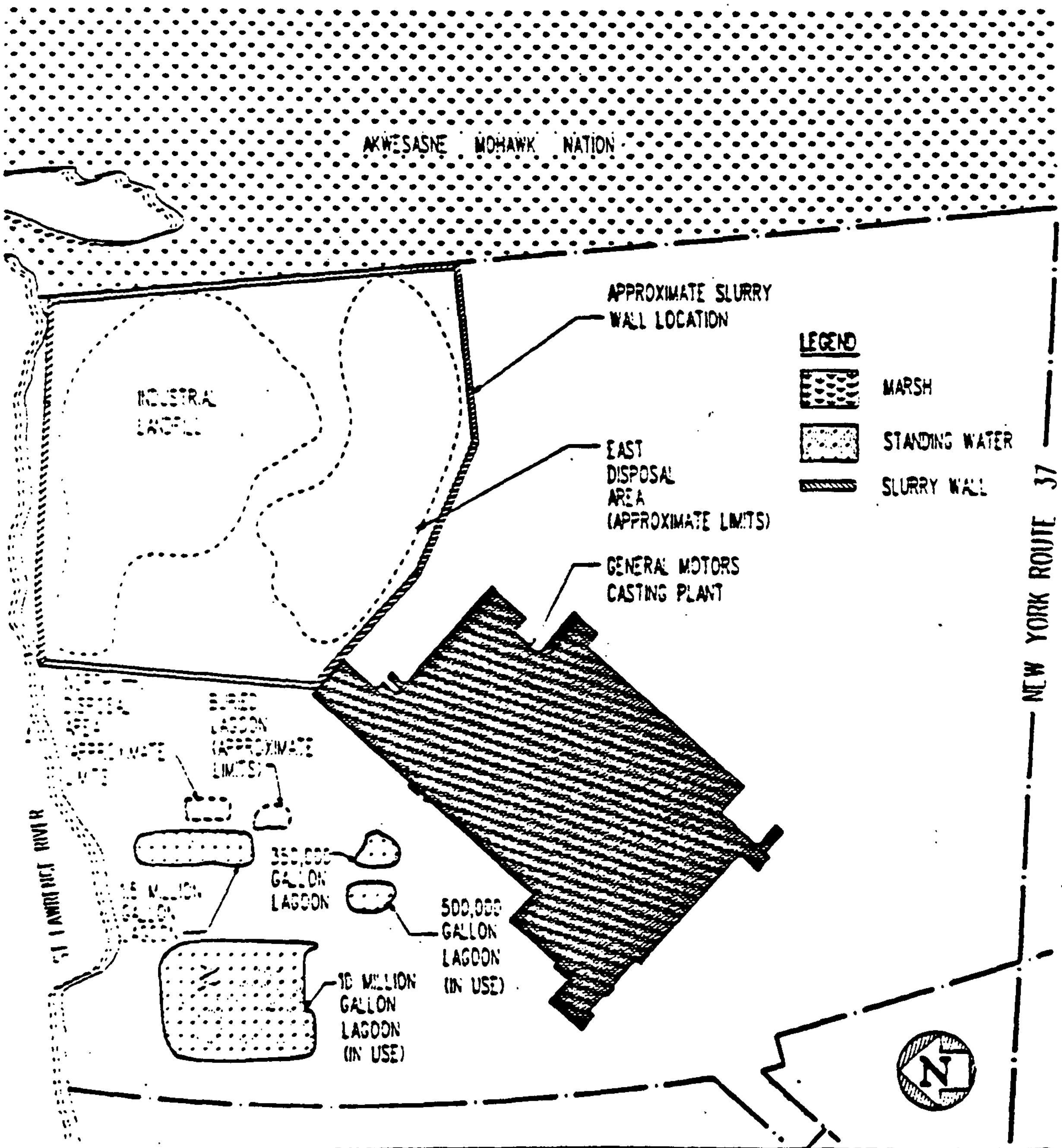
GEOLOGIC CROSS SECTION OF
INDUSTRIAL LANDFILL AND EAST DISPOSAL AREA

SOURCE: G.M. REMEDIAL INVESTIGATION, MAY 1986



APPROXIMATE EXTENT OF EXCAVATION TO ACHIEVE
500 PPM ACTION LEVEL IN THE EAST DISPOSAL AREA

FIGURE 4



APPROXIMATE LOCATION OF INDUSTRIAL LANDFILL / EAST DISPOSAL AREA SLURRY WALL

FIGURE 5

SCALE 1"=100'-0"

APPENDIX 2

TABLES

TABLE 1
SUMMARY OF RI RESULTS
GMC-CPD MASSENA
(ABBREVIATIONS DEFINED AT END OF TABLE)

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
1. NORTH DISPOSAL AREA			
a. Soils/Sludge	PCBs (Total)	S: 0.27 - 12,000 ppm (28/28) Median = 6.1 ppm S/S: 0.11 - 31,000 ppm (56/61) Median = 30 ppm	Two patterns of PCB concentrations with depth are evident. One indicates decreasing concentration with depth. PCB is at less than 10 ppm by a depth of 11 feet. The second indicates concentration of > 25 ppm at a 20-foot depth.
	VOCs	S: No detects S/S: VC 0.158 ppm (1/9) PCE 0.8 ppm (2/9) Benzene 0.01 ppm (1/9) MEK 0.1 ppm (1/9) DCE 0.3 ppm (1/9)	Fifteen different VOCs detected in soil samples. All VOC concentration values in soil borings were less than 0.3 ppm, with the exception of PCE and DCE in two samples.
	Phenol/Substituted Phenol	S: No detect S/S: Up to 5000 ppm (3/9)	Two borings accounted for the only quantifiable observations of substituted phenols (2,4-dimethyl-phenol, 2-methylphenol, and 4-methylphenol). The highest concentrations of phenols were associated with areas of past waste disposal or treatment.
	PNAs	S: BMDL S/S: 2 Methylnaphthalene 2.0 ppm (1/9)	Eleven PNAs were detected in surficial soils and boring samples. All PNAs, with the exception of 2-methyl-naphthalene, were detected below the MDL.

S = Surface
S/S = Subsurface
BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
PCB's = Polychlorinated Biphenyls
PNA's = Polynuclear Aromatic Hydrocarbons

POOR QUALITY ORIGINAL

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
[illegible]

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Phthalates	S: Up to 2.0 ppm (2/4) S/S: Up to 17 ppm (3/9)	Four phthalate compounds were detected in surficial soil and boring samples. Quantifiable concentrations of phthalate compounds ranged from 0.091 to 17.8 ppm in five of thirteen samples.
	Metals	S: See comment	Only manganese and magnesium were observed at concentrations above those in background samples. Neither constituent warrants consideration for remedial action.
b. Ground Water	PCBs (1248) (MW 24B, MW14A, MW14B)	Not Detected to 0.0041 ppm	Results indicate lower concentrations in Phase II RI in comparison to Phase I RI.
2. EAST DISPOSAL AREA			
a. Soils	PCBs (Total)	S: Up to 41,000 ppm (60/68) Median = 12 ppm S/S: Up to 30,000 ppm (87/89) Median = 2.5 ppm	Most of the PCBs were found within the boundaries of previous sludge disposal areas. Three additional areas adjacent to the sludge disposal areas were also defined.
	VOCs	S: MEK up to 0.01 ppm (1/8) S/S: Xylene up to 0.008 ppm (4/18) Toluene up to 0.01 ppm (4/18)	Phase I and Phase II RI results indicated the presence of eleven VOCs. These concentrations are low and do not warrant further assessment.

S = Surface
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BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
PCB's = Polychlorinated Biphenyls
PNA's = Polynuclear Aromatic Hydrocarbons

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Phenols/Substituted Phenols	S: Up to 11,000 ppm (16/22) S/S: Up to 8,000 ppm (3/18)	Phenol and three substituted phenols (see 1A) were detected in soil and boring samples. Phase I and II results indicate they were present within and below waste materials but not in surrounding soils.
	PNAs	S: BMDL to 0.6 ppm (2/8) S/S: BMDL to 0.6 ppm (3/18)	Sixteen PNAs were detected in soil and boring samples. The highest PNA concentration reported was 0.6 ppm.
	Phthalates	S: Up to 2 ppm (3/8) S/S: Up to 8 ppm (18/18)	Five different phthalate compounds were detected in soil and sludge samples. All of these compounds correspond to areas of past waste disposal.
	Metals	See Comments	Means and ranges typically comparable to background.
b. Ground Water	PCBs (1248) (MW-27A)	Up to 0.0017 ppm	Detected in first round of sampling but could not be confirmed by three subsequent rounds.
	Phenol (MW-27A&B)	Up to 0.06 ppm	Two rounds of Phase I RI results indicated presence of phenols. The two rounds of Phase II RI indicated no detectable phenols.

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BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
5. INDUSTRIAL LANDFILL a. Soils/Waste	PCBs (Total)	S: Up to 45 ppm (27/27) Median = 1.7 ppm S/S: Up to 4300 ppm (80/90) Median = 1.7 ppm	
	VOCs	S: BMDL S/S: TCE up to 1.1 ppm (2/12)	Ten different VOCs were detected in boring samples. Of fourteen detectable values in soil boring samples, 9 were found in two samples. Contamination is generally isolated and at low levels.
	Phenols/Substituted Phenols	S: Up to 8 ppm (1/6) S/S: Up to 51 ppm (2/12)	2,4-dimethylphenol, 4-methylphenol and phenol were detected in two soil boring samples.
	PNAs	S: BMDL S/S: Up to 3 ppm (2/12)	Fifteen different PNAs were detected in soil boring and surface soil samples. Twenty-three of 32 observations of PNAs were BMDL. One sample accounted for 13 of 32 PNA occurrences.
Phthalates		S: Up to 4 ppm (2/6) S/S: Up to 5 ppm (12/12)	Four phthalates were detected in soil boring and surface soil samples from this area. In five of the 18 samples, the concentrations are below MDL.

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(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Metals	See Comments	Five samples out of 20 showed levels above background (Al, As, Co, Cu, Cr, Fe, Ni, Zn). The occurrence of trace metals is probably due to the presence of foundry sands and not to the disposal of PCB waste oils.
b. Ground Water	PCBs (1248) (MW-16A&B)	Up to 1.3 ppm	Only samples from well 16A and 16B showed a consistent occurrence (PCBs). The Phase II data indicate the extent of hazardous substance migration in ground water in the vicinity of the landfill is more limited than shown by the Phase I RI data.
	VOCs (MW-16B)	1,2 DCE up to 0.686 ppm (6/6) TCE up to 0.050 ppm (4/6) VC 0.050 ppm (4/6)	Only samples from well MW-16B showed a consistent pattern of VOC occurrence. Phase II RI data showed lower concentrations.
	Phenols/Substituted Phenols	Up to 0.024 ppm	Concentrations decreased from Phase I RI results to Phase II RI results.
	PNAs (MW-26B)	Up to 0.180 ppm	Four PNAs detected in MW-26B in Phase I and not Phase II.
	Phthalates (several wells)	Up to 0.082 ppm (2/16)	Phthalates were seen in the Phase I RI but not in Phase II RI sampling of wells.
	Metals	See Comments	All were within background concentrations.

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POOR QUALITY ORIGINAL

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
4. LAGOONS			
a. Sludges	PCBs (1248)	Up to 750 ppm (19/19)	All lagoons were found to have PCBs in and/or beneath sludge within the lagoons and soil immediately adjacent to lagoons.
	VOCs	PCE up to 6 ppm (5/14) Toluene up to 28 ppm (14/14) TCE up to 3 ppm (5/14) VC up to 2 ppm (7/19) Xylenes up to 1.5 ppm (4/14)	Thirteen VOCs were detected in soil and/or sludges from the lagoon area. VOCs showed up most often and were generally at the highest concentrations in sludges from the 350,000-gallon lagoon. Eight different VOCs were detected from sludges from the 500,000-gallon lagoon. Five different VOCs were detected in the 1.5 m-gallon lagoon.
	Phenols/Substituted Phenols	Up to 26,000 ppm (14/14)	Constituents included phenol, 2,4-methylphenol, and 4 methyl-phenol.
	PNAs	Up to 30 ppm (3/14)	Nine PNAs were detected in sludges from one or more of the lagoons. Sixteen of 37 reported occurrences of PNAs were of concentrations below the MDL.
	Phthalates	Up to 37 ppm (3/14)	Only one phthalate was detected in the 350,000-gallon lagoon. Three phthalates were detected in the 1.5 M-gal lagoon. Two phthalates were detected in the 500,000-gallon lagoon.

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TCE = Trichloroethylene
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Nitrosodiphenylamine	Up to 260 ppm (4/14)	Detected in the 350,000-gallon lagoon.
	Metals	See Comments	Eleven of 23 metals exceeded background, notably C, Pb, Hg.
b. Soils	PCBs (Total)	S: Up to 280 ppm (11/11) Median = 7.6 ppm S/S: Up to 41 ppm (38/43) Median = 11 ppm	PCB concentrations ranged from BMDL to 280 ppm.
	VOCs	S: No detects S/S: MEK up to 0.1 ppm (4/6)	Five VOCs were detected in soil samples. With the exception of MEK, all values of VOCs were less than 0.01 ppm.
	Phenols/Substituted Phenols	S: No detects S/S: Up to 4 ppm (2/6)	All concentrations of compounds in this group were observed below the MDL, with the exception of phenol in one sample.
	PNAs	S: BMDLs S/S: BMDLs	Six PNAs were detected (below the MDL) in the surface soil samples.
	Phthalates	S: BMDL (1/6) S/S: Up to 17 ppm (6/6)	The surface soil sample contained only di-n-butylphthalate at below MDL. Bis(2-ethyl hexyl) phthalate and di-n-butylphthalate were detected below the MDL in all boring samples.
	Metals	See Comments	Ni, Cu, Hg were found above background.

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POOR QUALITY ORIGINAL

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
c. Ground Water	PCBs (1248) (22B)	Up to 0.007 ppm (at 22B)	The RI I data from MW21B suggested migration of PCBs from the 10 M-gallon lagoon. Both Phase II samples from MW-21B were free of detectable PCBs. This makes it uncertain if PCBs are migrating by a ground water pathway. Three of four rounds from MW-14B and MW-24B produced reportable PCB levels indicating the probable existence of PCBs in ground water.
	VOCs	See comments	A few constituents were noted at low concentrations.
	Phenols/Substituted Phenols (22B)	Up to 2.7 ppm (at 22B)	Phenols were detected in all rounds from MW-22B.
	PNAs	No detects	
	Phthalates (22B)	Up to 0.029 ppm (at 22B)	Detected above BMDL in MW-22B and MW24B in one of four rounds.
	Metals	See comments	All were within background concentrations. Mercury was reported at 2.6 ug/L (over the MCL) from MW-22B. This was not confirmed by other RI sampling rounds or NYDEC split samples.

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POOR QUALITY ORIGINAL

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
5. ST. LAWRENCE RIVER SEDIMENT	PCBs	S: ND - 5,700 (38/39) Median = 24 ppm	Samples generally contained from 2 to 4 times as much Aroclor 1232 as 1248. This is the only location where other than Aroclor 1248 was detected. No measurable concentrations of the 2, 3, 7, 8-isomers of dioxin or furan were observed in any samples.
	VOCs	MEK Up to 0.0321 ppm (7/8)	Significant concentrations of VOCs were not observed.
	Phenols/Substituted Phenols	BMDL	Significant concentrations of acid extractables were not observed.
	Phthalates	Up to 3.22 ppm (8.8)	
	PNAs	Benzo(a)anthracene BMDL to 8 ppm.	Sixteen of PNAs were detected in the eight sediment samples collected adjacent to the site. No measurable concentrations of the 2, 3, 7, 8,-isomers of dioxin or furan were observed in any samples.
	Metals	See Comments	Mercury and selenium were above local background concentrations but within those reported for soils in New York.

S = Surface
S/S = Subsurface
BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
PCB's = Polychlorinated Biphenyls
PNA's = Polynuclear Aromatic Hydrocarbons

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
6. RAQUETTE RIVER	PCBs (Total)		
a. Sediments		S: 0.34 - 2.3 (2/4) Median = 1.3 ppm	In addition, a "Highly localized" II detect of 240 ppm at outfall was found.
b. Soils on River Bank		S: 0.22 - 32 (10/11) Median = 1.7 ppm	
7. OFF-SITE SOILS (UNNAMED TRIBUTARY)	PCBs (Total)	S: ND - 48 (49/82) Median = 0.59	The spatial distribution of PCBs indicates that runoff over a limited area in the southeast corner of the GMC-CFD facility was the primary route by which PCBs migrated from the facility.
	VOCs	S: MEK upto 0.9 ppm (3/15)	
	Phenols	S: BMDL (1/15)	
	PNAs	S: BMDL (15/15)	
	Phthalates	S: BMDL - 7.99 ppm (1/15)	
	Metals	See Comments	No metals were identified above background levels.

S = Surface
S/S = Subsurface
BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
PCB's = Polychlorinated Biphenyls
PNA's = Polynuclear Aromatic Hydrocarbons

TABLE 2

SUMMARY OF EXPOSURE ASSUMPTIONS AND EXPOSURES VIA ALL PATHWAYS FOR THE G.M. SITE

Pathway	Most Probable	Worst Case
Wildlife Consumption		
Consumption	6.6 g/day	6.6 g/day
Wildlife Concentration	23 mg/kg	33 mg/kg
Exposure	0.002 mg/kg-day	0.003 mg/kg-day
Soil Ingestion and Soil Dermal Contact		
Soil Ingestion	39 mg/day (child)	200 mg/day (child)
	10 mg/day (adult)	100 mg/day (adult)
Soil Concentration	0.065 mg/kg	3.3 mg/kg
Exposure	1.1×10^{-7} mg/kg-day	3.5×10^{-6} mg/kg-day
Water Ingestion		
Ingestion	1.4 l/day	2.0 l/day
Water Concentration	1.0 μg/l	7.5 μg/l
Exposure	2×10^{-5} mg/kg-day	2.1×10^{-4} mg/kg-day

TABLE 2 (cont.)

SUMMARY OF EXPOSURE ASSUMPTIONS AND EXPOSURES
VIA ALL PATHWAYS FOR THE G.M. SITE

Pathway	Most Probable	Worst Case
Breast Milk		
Ingestion	800 ml/day	800 ml/day
Milk Concentration	0.07 mg/l	0.22 mg/l
Exposure	8.9×10^{-5} mg/kg-day	2.8×10^{-4} mg/kg-day

where:
- g = grams
- mg = milligrams
- kg = kilograms
- l = liters
- µg = micrograms
- ml = milliliter

Source: "Baseline Risk Assessment for GM/Massena Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, September 15, 1989.

TABLE 3

SUMMARY OF CARCINOGENIC RISKS TO ADULT MOHAWKS

Pathway	Most Probable	Worst Case
Wildlife Consumption	1.7×10^{-2}	2.4×10^{-2}
Soil Ingestion/ Dermal Contact	8.5×10^{-7}	2.7×10^{-5}
Water Ingestion	1.5×10^{-4}	1.7×10^{-3}
Breast Milk	6.8×10^{-4}	2.2×10^{-3}
TOTAL	1.8×10^{-2}	2.7×10^{-2}

Source: "Baseline Risk Assessment for GM/Massena Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, September 15, 1989.

TABLE 4

SUMMARY OF NONCARCINOGENIC EFFECTS ON ADULT MOHAWKS

Pathway	Most Probable Pathway HI	Worst Case Pathway HI
Wildlife Consumption	21.7	31.1
Soil Ingestion/ Dermal Contact	1.1×10^{-3}	3.5×10^{-2}
Water Ingestion	0.2	2.1
Breast Milk	8.9×10^{-1}	2.8
CUMULATIVE HI	22.8	36.0

where: HI = hazard index

Source: "Baseline Risk Assessment for GM/Massena Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, September 15, 1989.

TABLE 5

G.M. SITE SECOND OPERABLE UNIT
CLEANUP, TREATMENT, AND RESIDUAL LEVELS

Medium	Contaminant	Cleanup Level	Treatment Level	Residual Level*
Sludge, Visibly Oily Soil	PCBs	10 ppm	10 ppm	10 ppm**
Non-oily Soil on G.M. Property	PCBs	10 ppm	500 ppm	10 ppm
Groundwater	PCBs	0.1 ppb	0.1 ppb	≈ 65 ppt ***
	Total Phenols	1 ppb	1 ppb	1 ppb
	1,2 DCE	5 ppb	5 ppb	50 ppb
	TCE	5 ppb	5 ppb	3 ppb
	VC	2 ppb	2 ppb	300 ppt
Collected Site Surface Water Runoff	PCBs		≈ 65 ppt ***	≈ 65 ppt ***
	Total Phenols		1 ppb	1 ppb
	1,2 DCE		50 ppb	50 ppb
	TCE		3 ppb	3 ppb
	VC		300 ppt	300 ppt

where:
- ppm = parts per million
- ppb = parts per billion
- ppt = parts per trillion
- 1,2 DCE = 1,2-(trans)-dichloroethylene
- TCE = trichloroethylene
- VC = vinyl chloride

* Residual levels are those levels which must be met in the residual of any treatment process which is employed to remediate the Site.

** In compliance with TSCA regulations, sludge with initial PCB concentrations above 500 ppm is subject to a 2 ppm residual level.

*** Water would be treated to comply with SPDES which currently requires that PCB concentrations in the discharge be non-detectable, down to the method detection level, using EPA Laboratory Method Number 608.

TABLE 6

COSTS ASSOCIATED WITH EXCAVATION AND ON-SITE TREATMENT OF MATERIALS IN THE EAST DISPOSAL AREA WITH PCB CONCENTRATIONS ABOVE 10 PPM

Alternative	Construction Cost ($M)	Annual O&M Cost ($K/year)	Present Worth Costs ($M)
Excavation and Biological Treatment	33	102	34
Excavation and Chemical Destruction	76	165	77
Excavation and Chemical Extraction	55	165	56
Excavation and Thermal Destruction	86	165	87
Excavation and Thermal Extraction	76	165	77
Excavation and Solidification	39	165	40

where: O&M = operation and maintenance
$M = millions of dollars
$K = thousands of dollars

Source: Draft Feasibility Study for G.M. Site, November 1989

TABLE 7

COSTS ASSOCIATED WITH EXCAVATION AND ON-SITE TREATMENT OF MATERIALS IN THE INDUSTRIAL LANDFILL WITH PCB CONCENTRATIONS ABOVE 10 PPM

Alternative	Construction Cost ($M)	Annual O&M Cost ($K/year)	Present Worth Costs ($M)
Excavation and Biological Treatment	61	102	61
Excavation and Chemical Destruction	176	165	177
Excavation and Chemical Extraction	125	165	126
Excavation and Thermal Destruction	202	165	203
Excavation and Thermal Extraction	176	165	177
Excavation and Solidification	87	165	88

where: O&M = operation and maintenance
$M = millions of dollars
$K = thousands of dollars

Source: Draft Feasibility Study for G.M. Site, November 1989

TABLE 8

ESTIMATED WORST CASE TRANSIENT CANCER RISKS AND NONCARCINOGENIC EFFECTS FOR ADULT INDIANS DURING IMPLEMENTATION OF CERTAIN REMEDIAL ACTIONS

Alternative	Transient Cancer Risks to Adult Indians	Transient Noncarcinogenic Effects on Adult Indians (Hazard Index)
Capping of the East Disposal Area	2.9×10^{-6}	3.7×10^{-3}
Capping of the Industrial Landfill	9.1×10^{-8}	1.2×10^{-4}
Excavation and Treatment of Material in the East Disposal Area with PCB Concentrations above 10 ppm	7.8×10^{-6}	5.5×10^{-3}
Excavation and Treatment of Material in the Industrial Landfill with PCB Concentrations above 10 ppm	2.8×10^{-5}	3.0×10^{-2}

Source: "Risk Assessment for Five Remedial Alternatives at the G.M. Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, April 2, 1990.

TABLE 9

SUMMARY OF COSTS OF SELECTED SECOND OPERABLE UNIT REMEDY

Component of Selected Remedy	Construction Cost ($M)	O&M Costs ($K/year*)	Present Worth Cost($M)**
Mixed Treatment/ Containment of Material in the East Disposal Area ***	24 -38****	367 (2 years) 15 (28 years)	24 - 38****
Capping (with a composite cover)/ Groundwater Containment of the Industrial Landfill***	8	200 (30 years)	11
TOTAL*****	28 - 42****	567 (years 1 - 2) 200 (years 3 - 28)	31 - 45****

* O&M begins after completion of construction.

** Based on an assumed discount rate of five percent

*** Includes cost for slurry wall around both the Industrial Landfill and the East Disposal Area.

**** Costs will depend on the type of technology employed to treat material in the East Disposal Area with PCB concentrations above 500 ppm.

***** Reflects the cost savings associated with installation of a single slurry wall around both the East Disposal Area and the Industrial Landfill.

TABLE 10

MAJOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AMONG OTHERS, ASSOCIATED WITH THE SECOND OPERABLE UNIT SELECTED REMEDY

Chemical-Specific ARARs

- Safe Drinking Water Act
  - Maximum Contaminant Level (MCL) for PCBs, trichloroethylene, vinyl chloride, 1,2 - trans-dichloroethylene
- Clean Air Act
  - National Primary and Secondary Ambient Air Quality Standards at 40 CFR Part 50
- New York State Requirements
  - Groundwater regulations at 6 NYCRR Part 703
  - Surface water regulations at 6 NYCRR Part 701, including Appendix 31
  - Air quality standards at 6 NYCRR Part 257

Action-Specific ARARs

- Toxic Substances Control Act
  - 40 CFR 761.60-79 PCB disposal requirements
- Resource Conservation and Recovery Act
  - Closure requirements at 40 CFR 264 Subparts G, K, L, and N
  - Groundwater monitoring requirements at 40 CFR 264 Subpart F
  - Incineration requirements in 40 CFR 264 Subpart O
  - Design and operating requirements for waste piles at 40 CFR 264 Subpart L
  - Design and operating requirements for a landfills at 40 CFR 264 Subpart N
  - Design and operating requirements for tank at 40 CFR Subpart J
  - Generator requirements at 40 CFR 262

TABLE 10 (cont.)

MAJOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AMONG OTHERS, ASSOCIATED WITH THE SECOND OPERABLE UNIT SELECTED REMEDY

- Transporter requirements at 40 CFR 263
- Land Disposal Restrictions (for hazardous treatment residuals only) at 40 CFR 268

- Clean Water Act
  - Best Available technology and monitoring requirements at 40 CFR 122.44(a, e, i)
  - Best Management Practices program requirements at 40 CFR 125.100
- Clean Air Act
  - Standards of Performance for Incinerators at 40 CFR 60 Subpart E
- New York State Requirements
  - Solid Waste Management Facility regulations at 6 NYCRR Part 360
  - Final status standards for hazardous waste facilities at 6 NYCRR Part 373-2
  - Implementation of National Permit Discharge Elimination System at 6 NYCRR 750-757

Location-Specific ARARs

- Executive Orders 11988 and 11990
  - Floodplains management and protection of wetlands at 40 CFR 6.302 and 40 CFR 6, Appendix A
- Fish and Wildlife Coordination Act
  - Protection of endangered species and wildlife at 33 CFR Parts 320-330 and 40 CFR 6.302
- National Wildlife Historical Preservation Act
  - Preservation of historic properties at 36 CFR 65 and 36 CFR 800

TABLE 10 (cont.)

MAJOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AMONG OTHERS, ASSOCIATED WITH THE SELECTED REMEDY

- Endangered Species Act
  - Protection of endangered species at 50 CFR 200, 50 CFR 402
- Wild and Scenic Act
  - Protection of recreational river at 40 CFR 6.302(e)
- Coastal Zone Management Act
  - Conduct activities in manner consistent with State program
- New York State Requirements
  - Wetlands land use regulations at 6 NYCRR Part 661
  - Freshwater wetlands requirements at 6 NYCRR 662-665
  - Endangered species requirements at 6 NYCRR 182
  - Coastal zone management policies at 1 NYCRR Part 600

"To Be Considered" Requirements

- Toxic Substances Control Act
  - 40 CFR 761.120-135 PCB Spill Policy
- New York State Requirements
  - Guidance for control of toxic air contaminants at Air Guide 1

APPENDIX 3

ESTIMATED SLURRY WALL COSTS

General Motors CFD

Hydraulic Evaluation: Question - How much less water will need to be treated if a slurry wall is placed around the Industrial Landfill?

Case 1: Cap only.

Water volume needing treatment is assumed to be groundwater discharging to St. Lawrence River downgradient of Industrial Landfill.

Q = water volume discharging to river in cm^3/s

K_T = hydraulic conductivity of till unit

K_G = hydraulic conductivity of glaciofluvial unit

A_T = cross-sectional area of fill unit at discharge zone. (Length of discharge zone x unit saturated thickness)

A_G = cross-sectional area of glaciofluvial unit at discharge zone (Length of discharge zone x unit thickness)

i = typical gradient across landfill to discharge point

$K_T = 4.4\times10^{-5}$ cm/s

$K_G = 2.0\times10^{-3}$ cm/s

$A_T = 15750\ ft^2 = 1.4\times10^{7}\ cm^2$

$A_G = 5250\ ft^2 = 4.8\times10^{6}\ cm^2$

$i = 2.9\times10^{-2}$

$$
\begin{aligned}
Q \text{ (total discharge)} &= Q_T + Q_G \\
&= K_T\, i\, A_T + K_G\, i\, A_G \\
&= (4.4\times10^{-5})(2.9\times10^{-2})(1.4\times10^{7}) + (2\times10^{-3}) \\
&\quad (2.9\times10^{-2})(4.8\times10^{6}) \\
&= 1.8\times10^{1}\ cm^3/s + 2.8\times10^{2}\ cm^3/s \\
&= 3.0\times10^{2}\ cm^3/s = 300\ cm^3/s = 0.3\ l/s
\end{aligned}
$$

$0.3\ l/s \times 86{,}400\ s/d \times 365\ d/yr = 9.46\times10^{6}\ l/yr = (\underline{2.5\times10^{6}\ gal/yr})$

Case 2: Cap and slurry wall encapsulation.

Water volume needing treatment is assumed to be equal to the amount of water infiltrating through the cap of a cap and slurry wall encapsulation system.

V_I = volume of water infiltrating through cap

A_C = area of cap in ft^2

R_A = rainfall (annual) in ft/yr

E_C = cap efficiency, in % infiltrating

A_C = 380,000 ft^2

R_A = 2.75 ft/yr

E_C = 0.02

$V_I = A_C \times R_A \times E_C$

$= (380{,}000\ ft^2)\ (2.75\ ft/yr)\ (0.02)$

$= 20{,}900\ ft^3/yr$

$= 156{,}300$ gal/yr

Comparison of Case 1 vs. Case 2

Case 1 (Cap only encapsulation) treatment costs

This remedy requires that 2.5×10^6 gal/yr of water be treated. At $0.10 per gallon, it will cost $250,000 per year to treat.

Case 2 (Cap and slurry wall encapsulation) treatment costs

This remedy requires that 156,300 gal/yr of water will be treated. At $0.10 per gallon, it will cost $15,630.

Case 1 Capital Costs

The cost of installing the new cap on the Industrial Landfill is estimated at $7.1 million.

Case 2 Capital Costs

The cost of installing the new cap on the Industrial Landfill and installing a slurry wall, keyed into the till beneath the lower glaciofluvial unit, is $7.1 million (cap) plus $1.24 million (slurry wall), or $8.34 million.

Cost of Slurry Wall

C= Cost

P= unit price of slurry wall installation, in \$/vsf (Vertical square foot)

L= Length of slurry wall

D= average depth of slurry wall

P=	\$10/vsf	C=	PxLxD
L=	3,100 ft.	=	(\$10/vsp)(3100)(40)
D=	40 ft.	=	$\$1.24 \times 10^6$

Discussion

The maintenance and monitoring costs for each case (cap repair, plumbing/electrical repairs, etc.) should be comparable. The major point to be made in this evaluation is the trade-off of additional capital expense (\$1.24 million) for the installation of the slurry wall around the Industrial Landfill as opposed to the additional \$234,000 annual expense of water treatment that will be required if no slurry wall is installed.

It becomes readily apparent that the installation of the slurry wall system, by significantly reducing the volume of water required to be treated, will pay for itself within 5-10 years.